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[OFFICIAL NOTICE.]

Thirty-Second Annual Meeting, New England Association of Gas Engineers.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS,
OFFICE OF THE SECRETARY,
NEW BEDFORD, MASS., Dec. 26th, 1901.

The Thirty-Second Annual Meeting of the New England Association of Gas Engineers will be held in Boston, February 19 and 20, 1902. The headquarters will be in Youngs' Hotel as usual; but, owing to the increased attendance at the meetings, which necessitates the securing of a larger assembly room, the sessions will be held in the Parker House.

A lively interest in the meeting is being shown by members, and the programme in detail will be issued later. W. W. GIFFORD, Sec'y.

[OFFICIAL NOTICE.]

Ohio Gas Light Association—Novelty Advertising Department.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF THE SECRETARY,
DELAWARE, O., Dec. 24, 1901.

Members of the Ohio Gas Light Association are earnestly requested to send to Mr. B. W. Perkins, South Bend, Ind., any contribution they may have for the Novelty Advertising Department of the Association. This is a most favorable time, just at the close of the season, when the many successful methods of advertising tried during the year are still fresh in the minds of those who used them. T. C. JONES, Sec'y.

BRIEFLY TOLD.

PROGRESS IN THE SUBSCRIPTION TO THE LIBRARY AND INFORMATION FUND OF THE WESTERN GAS ASSOCIATION.—While good progress has been made in the instance of putting together the sum needed by the Western Gas Association for the realization of its project to "compile a complete index of all the printed and reference data published upon any and all gas topics, subject matters, etc.," it appears to us rather odd that the complete amount asked for is not already in hand. The actual money required for the work contemplated, the nature of which has been fully outlined in prior issues of the JOURNAL, has been put at $1,500 per annum, and it has been determined that a period of three years will be required to complete the indexing, etc. Subscriptions from companies or individuals, in sums of $5 per annum or upward, for the three years, have been asked for, and the result of the subscription to date is as follows:

Subscriber.	Per Annum.
Amount previously acknowledged	$665
Ann Arbor (Mich.) Gas Company	20
Alpena (Mich.) Gas Company	10
Bellevue (O.) Gas Company	10
Denver (Col.) Gas and Electric Company	50
Freeport (Ills.) Light and Fuel Company	20
Freemont (O.) Gas, Electric Light and Power Company	10

JAN 13 1902

Subscriber.	Per Annum.
Goshen (Ind.) Gas Company	$10
Helme & McIlhenny, Philadelphia, Pa	10
Joplin (Mo.) Gas Company	20
Kersting, Albert F., Danville, Ky	5
Lynn, Jas. T., Detroit, Mich	20
Marion (O.) Gas Company	10
Metric Metal Company, Erie, Pa	10
Moses, Frank D., Trenton, N. J	10
Port Huron (Mich.) Gas Company	20
Rome (N.Y.) Gas, Electric Light and Power Company	10

This shows a total subscription on per annum account of $910, to which must be added three lump subscriptions, amounting to $175, which, if spread over the 3-year period total, goes to show that virtually two-thirds of the necessary sum is pledged. In reference to the subscriptions noted in the above list, it seems worthy of especial comment that Mr. James T. Lynn, of Detroit, who ably served the Association as its President in 1898, not only comes forward with a substantial subscription on personal account, but also responds in like manner for each of the many lighting companies in which he is interested. We are quite sure that the names of at least 50 other companies and individuals would now be on the subscription lists were it not for forgetfulness on their part of the matter in hand. Send in your subscriptions at once to Mr. James W. Dunbar, Secretary, New Albany, Ind., who will promptly reply to any queries respecting the object of the fund and the benefits to be derived from becoming a subscriber thereto.

Fourth Annual Meeting, Southwestern Gas, Electric and Street Railway Association.—At a recent meeting of the Directors of the named Association preliminary arrangements for its 4th annual meeting were agreed upon. The meeting is to be held in San Antonio, Tex., April 18, 19, 20 and 21. Headquarters and assembly room will be announced later on, but that both will be in every sense acceptable is assured from the fact that the selection is committed to Mr. E. H. Jenkins, President of the San Antonio Gas and Electric Company. Besides the address of the President (Mr. H. F. MacGregor), the paper list as now predicated calls for seven separate numbers. It goes without saying that the social side of the convention will be quite up to its technical course, for the gentlemen in charge of the pleasuring programme have directed such proceedings before The complete programme will appear in the Journal in due time.

Transactions for 1901 of the Incorporated Gas Institute.—We are indebted to the courtesy of Mr. Walter T. Dunn, Secretary of the Incorporated Gas Institute, England, for a copy of the "Transactions" of the Institute for last year. The book, which is a handsome sample of the printers', binders' and illustrators' art, contains a complete report of the Institute's 38th annual meeting, copious notes on the visit to England of the French Association of Gas Managers (July, 1901), and extended mention of the proceedings of the Gas Section of the International Engineering Congress—Glasgow, September, 1901.

Notes.—With much regret we chronicle the death of Mrs. Keller, the estimable wife of Mr. Martin Keller, of the Columbus (Ind.) Gas Light and Coke Company, whose demise occurred in the Keller residence, the afternoon of the 22d ult. Deceased who was in her 53d year, had been a sufferer from pulmonic trouble for 2 years, and her patience through it all was nothing short of remarkable.——The permanent organization of the Dowagiac (Mich.) Gas and Fuel Company has been perfected. The concern is capitalized in $50,000, and Mr. Henry W. Douglas, of Ann Arbor, Mich., is prominent in its affairs. The plant will be erected the coming spring. The officers are: President and Treasurer, F. W. Lyle; Secretary, C. T. Amsden.——A chap named Joseph Hackett robbed an automatic gas meter owned by the new Britain (Conn.) Gas Light Company. On conviction he was fined $100 and costs, and sent to jail for a period of 6 months.——The Citizens Gas and Fuel Company, of Terre Haute, Ind., has secured a 10-year lease of the commodious office building, No. 636 Wabash avenue, and General Manager Diall proposes to fit it up in modern style for the purposes of the Company. A handsome showroom will be a prominent feature of the new establishment. The location is an excellent one, and the change from the Ohio street offices will be appreciated by the Company's patrons. ——Mr. Harvey W. Brown, President of the Minneapolis (Minn.) Gas Light Company, died at his home in Minneapolis, the evening of December 31st. He was in his 68th year, and had been a resident of Minneapolis since 1874.——The storage capacity of the Consumers Gas Company, of Reading, Pa., is to be doubled.

[Prepared for the Journal, by "Machinist."]

Gas From Oil: Process as Conducted on the Pacific Coast.

Upon arrival on the Pacific Coast your correspondent found that considerable interest was centered in the processes of getting gases from the natural oils of the country. As is known to persons interested in illuminating, there has been quite a widespread movement in the direction of getting oils for illuminating purposes from the productive wells of the State of California, and a great many companies and individuals are concerned in the work at the present time. Recently there has been a movement to produce gas from these rich petroleum oils and a company has been formed for the purpose; in fact, a number of different organizations are experimenting along the same line. In this article I will attempt to give some facts relative to the producing of gas oils in the State and the methods of using the same. The leading locality is in the Kern river section. The principal company interested in securing the gases from the oils of this region has been formed with a capital said to be well into the millions. The object of this company, as well as of others working on the same plans, is to provide gas for a number of different cities and towns, manufacturing the gas from the gas oil wells of the Kern sections. It is proposed to put in a pipe line some hundreds of miles in length for carrying gas from the point of generation to the point of consumption. It will be built somewhat on the same plans as the great gas pipe line which extends from the natural gas fields of Virginia to Chicago, Ills. It is calculated that gas pumping stations will be needed at intervals and provisions are made for these. It is supposed that 10 to 12-inch mains will be used. The gas will be drawn from the numerous oil springs which develop in the petroliferous strata and under certain conditions cause gases to form. Sometimes these gases generate to such volume that, when the oil reservoir is tapped, as in the event of drilling to sink a case, the gas causes the well to spout forth quantities of oils, loose earthy substances, small stones, etc. The spouting well results from the pressure of the gases. In Fig. 1 is shown a section of the earth's strata to represent the appearance of the gas well, with the confined oils in the bottom and the fumes of gases on top of these oils. The reservoir is marked *B*, and into it is sunk the shaft which carries the pipe or case *A*. The saturated stratum is frequently practically hermetically sealed up by the oil-purged sides and top, and the gases are closed in too tight to pass off. It is a suitable tank in the earth of natural formation for the holding of gases. Sometimes these gases work through the fissures of the earth and pass off into space, impregnating the atmosphere to the extent of producing an odor which can be distinguished and which leads to the locality sought for by the prospectors. At times the gases pass out in sufficient volume to make it possible to ignite them, so that by sticking a little tube into the earth, and by waiting a few minutes, a small flame can be started by applying a lighted match. By processes of nature, true reserviors are often formed, which are subsequently filled with both oils and gases. In course of time, the light carburetted oils make their escape through the fissures, often leaving the gases in the confined chambers. To tap these gas reservoirs results in bringing forth the illuminating gases which may be utilized. The intention of most of the California companies is to make the gas direct from the oils in the fields, and reliance will not be placed upon the gases found in the natural reservoirs. Several processes are in operation for manufacturing gas from the natural oils of the State, and some of them are nearly perfected.

When the Chamber is Closed by Too Low Case.—In one place where the engineers were at work locating gas oil reservoirs, the case which was placed in position proved to be longer than was calculated as required. The engineers unknowingly forced the pipe downward until it reached the surface of the oil level, as at *D*, Fig. 2. In this cut the pipe is marked *C*. This resulted in closing the lower end of the case and no oil or gas could pass up. If the pipe had been high enough from the level of the oil surface then the gases would have a free passage up the pipe and out, where they could be caught and retained.

Excavating from the Side of a Hill.—The writer found the engineers at work at another point on the plan presented in Fig. 3, in which a sectional drawing is given of a gas well, *G*, and its contents. A case of steel about 8 inches in diameter was put through, as marked at *E*. This pipe tapped the gases of the well and the reservoir was soon emptied of its contents, some good gas being obtained and tested. It was noted that oil asphalt had formed by the fact that the petroliferous deposits had in course of time worked their way through the strata, as at *F*, and had accumulated on the surface at the base of the hill. Quite a number of companies are out in the fields after this asphalt, which they secure in

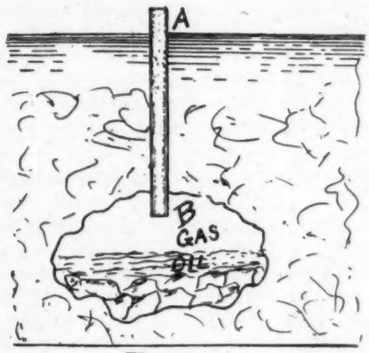


FIG 1

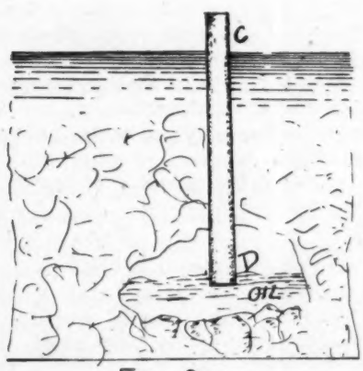


FIG 2

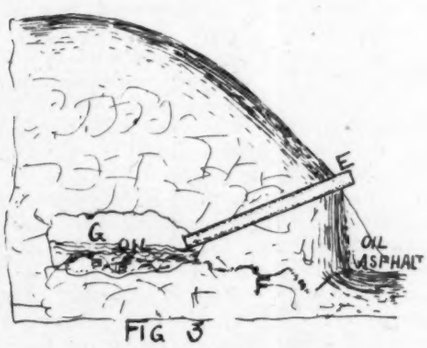


FIG 3

Gas Wells as they Exist in California.

two or three grades, for use in street paving, saturating paper and for roofing purposes.

Plan of Pumping Station.—At points where it is found necessary to establish pumping stations to force the gases along the lines of pipes, a number of different patterns of power pumps are proposed. One company has in view the plan presented in Fig. 4. The brick plant is provided with a boiler of necessary power, which is within the masonry. The engine is outside and is protected with a wood cover. The mild climate of California permits this sort of arrangement and does away with the necessity of costly and weather-tight structures. The main pipe line carrying the gas is at *J*, and this leads from the principal gas supplying depot, possibly at the point where the gas is manufactured from the oil, or taken direct from the natural gas reservoirs in the earth. In order to control the flow of the gas there is a check valve at *K*. The pipe now loops down as at *I*, and up again to join into the main pipe level *L*, as shown. The pipe is joined with the engine force pipe *H*, as illustrated. Thus the power pumps operated by the engine can force the gases along the pipes by pumping against them, and compelling them to continue the passage towards the city or town in which they are to be consumed.

Protection for Pipes.—Pipes which are used for this service require more or less exterior protection, because of the conditions through which they must pass in covering hundreds of miles of territory. Often the pipes are exposed to the effects of atmospheric conditions, which are found to be no worse than having the pipes buried in the earth and subjected to the evils arising therefrom. Hence we see that wood tubes or cases are provided in some instances, after the plan in Fig. 5. Here the pipe and valve are shown, and the mode of casing the pipe at *M M*. These cases are made from cedar or redwood of the State. There are vast quantities of redwoods growing in the country, and it can be secured as readily as pine woods are secured in the East. The wood is frequently coated with tar or other preparation before setting it into the earth, thus affording a protection for many years against insects, decay, etc. The framework of the casing is shown in the cut, and this frame is often packed with substances suitable for the preservation of the pipes and the protection of the same.

Very Strong Flanged.—I observed that some of the parties interested in moving gas from point to point on the Coast were utilizing very strong, flanged pipes, made in sections, and bolted together, as presented in Fig. 6. These parts of the pipe are made both from cast iron

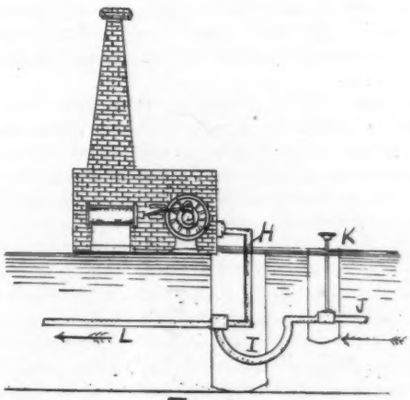


FIG 4

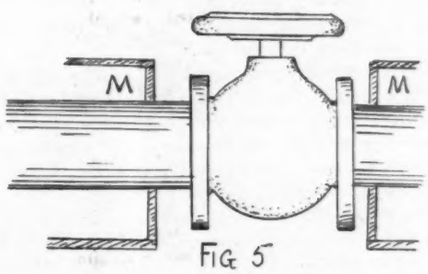


FIG 5

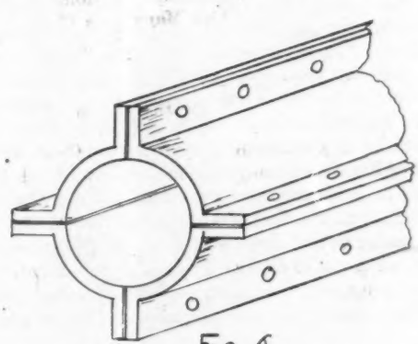


FIG 6

Gas Pumping Station.

and from wrought; also, steel is used. The object is to have a specially powerful piping for service in exposed sections on mountain sides, where the pipes are run over exposed trellises. Often the pipes are passed from one point to another in the rocky sections by suspending them across open points, using cables to support them. This requires that the pipes be very strong, and the plan used in Fig. 6 is frequently employed.

THE owners of the Lansing (Mich.) Gas Light Company have good reason for congratulating themselves over the progress made in the year just closed. Their trading showed an increase of over 12 per cent. The Company's payment on account of franchise tax for the twelve-month amounted to $1,121.19.

[Concluded from Page 6.]

The Vienna Municipal Gas Works.[1].

Starting Manufacture and Distribution.—Starting the new works and bringing the new distributing system into operation at a definite date in the busiest season of the year, coupled as it was with the necessity of transferring the meter connections at the same time, was a task such as has never before been required on such a scale of the technical staff of any gas works. It was, however, much lightened by the transfer to the Municipality of the meters belonging to the Imperial Continental Gas Association, already referred to; and for the most part the work on the consumers' premises consisted merely in making simultaneous reading of the indexes, and in closing the tap on one service pipe and opening that on the other. The work of changing over the meters was actually begun on October 25th and completed on December 24th, 1899; while the final cutting out of the service pipes of the Imperial Continental Gas Association was finished by February 24th, 1900. There were 58,200 meters transferred to the Municipality; and 40 parties of workmen and officials were engaged daily in effecting the change of supply.

Hitherto when gas works plant and mains have been first of all brought into use, gas has been directly introduced into them. But the great size of the Vienna installation, with the consequent multiplication of the risk of explosion owing to the formation of explosive mixtures of gas and air in the mains and plant, led to an endeavor being made to avoid such risks. Evidently there would be no danger of explosion if gas and air were not allowed to mingle in the apparatus. The idea of filling the distributing system with carbonic acid, was given up in deference to technical opinion. An original proposal of Dr. Murmann, of Vienna—to interpolate a buffer of carbonic acid between the air in course of expulsion and the inflowing gas—revived, however, the notion of completely displacing the air before admitting gas. It was finally decided, on the strength of favorable reports from Herren Bunte, Tieftrunk, Schwackhöfer, and Strache, to use gaseous products of combustion, or chimney gases, made for the purpose by Dr. Strache, to displace the air completely in the distributing system and gas works plant before introducing any coal gas.

The chimney gases were produced in a small plant consisting of a fan, a generator lined with firebrick (of 17¾ inches inside and 33½ inches outside diameter), a recuperator, a dust catcher, and a washer. Charcoal was consumed in the generator. The gases had a specific gravity of about 1.1, and, consequently, were but little heavier than air, in which respect they had a great advantage over carbonic acid. In order to prevent the formation of carbonic oxide, the combustion of the charcoal was systematically carried on with an excess of oxygen, amounting at the most to 3 per cent. This excess of oxygen was too small to give rise to any possibility of an explosive gaseous mixture occurring. The chimney gas mixture consisted essentially of nitrogen, carbonic acid, and a small proportion of oxygen, in addition to aqueous vapor. A strong odor was imparted to it by means of carbylamine and camphor. It was collected in one of the four gasholders, and driven thence into the apparatus, works mains, and distributing system. The cubical content of the distributing system was about 2,000,000 cubic feet, and that of the works mains and the crowns of the holders about 1,130,000 cubic feet; so that there was in all about 3,130,000 cubic feet of air to be expelled. Some 6,780,000 cubic feet of the chimney gas mixture was made; so that there was available fully twice as much as the volume of air it was to expel. The cost of the mixture amounted to a little over 2s. per 1,000 cubic feet, including capital charges on the generating plant; and of this amount, about 17 cents was the cost of odorizing it.

A detailed programme was drawn up for starting work in the proper sequence and manner; and a commencement was made on Aug. 14, 1899, by lighting up one bench of retorts in order to make the gas required for filling the mains, etc. From Sept. 25, 1899, one bench more was lighted up each day, in order to be in readiness to begin to take over the private consumer supplies from Oct. 25. It required 26 days' gradual heating to bring each setting to the proper heat for working. After the apparatus and works mains had been filled with chimney gases, coal gas was first made on Sept. 14, 1899; and the yards of the gas works were lighted with the gas on Sept. 15.

An exhaustive examination of the distributing system and services for leaks and fractures was commenced on August 14, 1899, in order to avoid the danger which would necessarily arise from them if existing when work was actually begun. The blowing out of the air in the mains was done in sections; and as the chimney gas mixture was heavier than air, it was introduced at the lowest points in the distributing system, and the air discharged at the highest points. This method was reversed when coal gas was introduced, and the chimney gases expelled. For this purpose, blow-off pipes were fixed, reaching nearly to the bottoms of the principal mains, in open spaces near the gas works; and provided with valves, and double insertions of wire gauze, to avoid any possibility of the flame striking back in case the escaping gaseous mixture should be accidentally ignited. Similar blow-off pipes, of 1½ to 2 inches diameter, were fixed at various points on the limits of the system, and at a few open spaces in the city.

A start was made with filling the trunk mains with chimney gases on September 24, 1899; and four days later coal gas was introduced in the more elevated districts, and gradually extended to the low-lying ones. Thus there was maintained between pipes filled with air and pipes filled with gas a considerable length of pipes filled with chimney gases. On October 13, 1899, the batswing burners to the number of 21,000, which had been used to burn off the inferior gas, were partially replaced by Welsbach burners; and all of them were replaced by October 25, 1899. From that date the whole installation was in working order; and all was brought into actual operation without any serious mishap.

1. *Journal of Gas Lighting.*

Charcoal Briquettes from Wood Waste in Sweden.

Respecting this matter *The Engineer*, of London, describing certain results thereon obtained by G. von Heidenstam, proprietor of a Swedish sawmill, says:

The wood should be thoroughly dry; though the presence of about 50 per cent. of water in the waste lumber requires the consumption of a large amount of fuel for this drying process as ordinarily carbonized. As the waste from lumber and sawmills varies greatly in form and size, it is found more convenient to reduce it to sawdust. In this sawing process, the lumber is made to pass between rollers which squeeze out much of the moisture. The sawdust to be carbonized passes to a drying apparatus, heated partly by waste steam from the engine and partly by steam direct from the boiler. This drying plant is located on an upper floor; and from it the dry sawdust is led, by a hopper, to the briquette presses below. The briquettes are delivered in a continuous string to the adjoining carbonizing apparatus. This latter consists of a number of upright iron cylinders, provided at the bottom with outflow pipes for the products of distillation, and at the top with a cast iron cover carrying a hydraulic press cylinder.

The process of carbonizing the wood is described as follows: The charge of briquettes is brought by a traveling crane over the mouth of the retort, is lowered into it, and the cover is put in place. Hydraulic pressure is then applied to the cover, forcing it down, and at the same time the fire is kindled in the furnace of the retort. The products of distillation pass through a cooling pipe to a collecting well, whence they are pumped to three reservoirs, and the tar and the wood alcohol are allowed to separate before undergoing further manipulation. When the charge is completely carbonized, the cover is taken off and a sheet iron cylinder is placed over the mouth of the retort; and in this latter the charcoal is raised and carried away upon a car to cool. The plant for this process is made at J. & C. G. Bolinder's Mechanical Works, at Stockholm, under Swedish patents.

A series of tests of the process has been carried out by eminent Swedish engineers, and the report quoted goes into very full detail. Summing up the results, we find that to carbonize the briquettes requires the consumption of about 58 pounds of wood per 220 pounds of briquettes. In apparatus now being made there will be room for 4,400 pounds of briquettes in each retort; and with a carbonization of 18 hours per day, for 300 days in the year, the annual product would be 800 metric tons per retort. In the plant described there are eight retorts, with an output of, say, 6,000 tons per year. The fuel used in drying the sawdust and heating the apparatus and the boilers is estimated at half the weight of the briquettes, as a maximum; and a plant of the dimensions described would thus annually require 9,000 tons of lumber waste.

From the 6,000 tons of briquettes are obtained.

	Per Cent.	Metric Tons.
Charcoal	33.43	2,005.8
Tar	8.34	530.4
Acetate of lime	5.00	300.0
Methylic alcohol and acetone	.75	45.0

At Swedish prices the receipts from this product amount to 206,772 kroners; and including in the expenses 10 per cent. for a sinking fund

on the capital cost of 300,000 kroners, the profits amount to 68,872 kroners; or $18,251.08, taking the kroner as worth 26½ cents in U. S. currency.

An analysis of the briquettes at the Royal Technical High School show that the briquette coal is pure charcoal, free from extraneous matter and possessing great solidity and density. A hectoliter of briquette coal, containing 9.4 per cent. of water, weighs 36.3 kilos., as compared with 13.8 kilos. for ordinary sawmill charcoal with the same amount of moisture. It is also only one third the bulk of ordinary charcoal. The tar is of a rather thin quality, and contains a considerable quantity of creosote; as it is uniform in quality it is especially useful for antiseptic purposes. Acetate of lime is used in producing acetic acid; and the methylic alcohol is largely employed in the manufacture of aniline colors and for producing the disinfectant, formalin.

The writer sums up his paper by noting the following advantages of the process: (1) A single system for working up the waste material by first putting it into the form of sawdust. (2) The cost of making the sawdust is amply repaid by the simultaneous mechanical drying and reduced labor cost of handling the product. (3) By reducing the wood to the form of briquettes, the apparatus for carbonizing is reduced in volume, as compared with scantling, as 235 kilos. is to 1,000 kilos. per cu. m. (4) The charcoal produced by the process is of great solidity, and the same products result as from dry distillation. (5) There is great economy in space required as compared with the carbonization of scantling, and no danger from fire—as in the latter process.

Lighting Incandescent Burners in Street Lamps.

The *Journal of Gas Lighting*, in describing the Auguet lamp lighting system, says the object in view was to affect the operation as expeditiously as possible, without damaging the mantles; and those who have attacked the problem have arrived at a generally satisfactory solution of it. One of the difficulties to be overcome was to enable the lamplighter, provided with the ordinary torch, to manipulate both incandescent and flat-flame burners, where the two systems happened to be employed in his district. This difficulty it was that M. Auguet attempted to overcome in devising the street lamps shown in the accompanying diagrams, by the use of which he claims that the gas can be instantaneously ignited by the aid of the pole, even in a strong wind—the lamp being completely closed before, during and after lighting. The system, which was recently fully described in *Le Gaz*, can be adapted to both internal and external ignition—Fig. 1 showing the former and Fig. 2 the latter arrangement.

Taking first Fig. 1, the appliance consists of a gas box *B*, into which the gas enters from below. The inlet is connected with the pipe *D*, which supplies the burner, by means of a small elbow pipe. From the side of the gas box starts the feed pipe for the igniting tube or pilot light *H*. The box is fitted with a valve *A*, furnished with an india-rubber washer *C*, which, by means of the lever *F*, having on its end a counterweight, exerts pressure on the valve, and hermetically closes the gas inlet at the bottom of the box; the top being shut by a copper screw stopper *G*, in the center of which is an opening for the passage of the rod of the valve *E*. The top of this rod is connected with the lever *F*. The counterweight consists of a copper cylindrical ring *I*, the upper opening of which is closed by a valve *J*, having a hinge joint and buffer spring; the lower part widening out like a funnel to allow the lighting torch to pass through. Inside the ring there is a projecting piece against which the torch strikes. At the top it is joined to the lever, and kept in a vertical position by the copper hoop *K*, in which it slides. This hoop forms part of the bottom of the lantern, to which it is fixed.

The method of lighting is as follows: The lamplighter first turns the tap, and then passes the torch through the ring *I*. The end of the torch raises the valve *J*, and comes in contact with the projection in the ring. By using a little pressure, the lamplighter raises both the ring and the valve *A*, so that gas can enter the box *B*, and supply the igniting tube. When the lower part of the valve rises to admit gas into the box, the top part presses against the under side of the stopper, and prevents the gas from passing through the hole containing the valve rod. The light in the torch being at this moment opposite the holes in the igniting tube, the jets are lighted, and the flame is communicated to the burner. The lamplighter then withdraws the torch, and by so doing allows the ring to fall and press against the valve which at once shuts off the gas from the tube, leaving only the burner itself alight. The arrangement for external lighting is composed of the following parts: (1) A copper cup to receive the torch; (2) a buffer button, with rod inside the cup, which allows the gas to enter the igniting tube; (3) a distributing tube containing a valve with a spiral spring; (4) a small vertical supply pipe conveying gas from the central pipe to the distributing tube, and the igniting tube conveying gas to the burner; (5) the central pipe, of copper, screwed on to the lantern cock by its lower end, the burner being attached to the end of the pipe; (6) the transverse copper band to which the whole appliance is fixed.

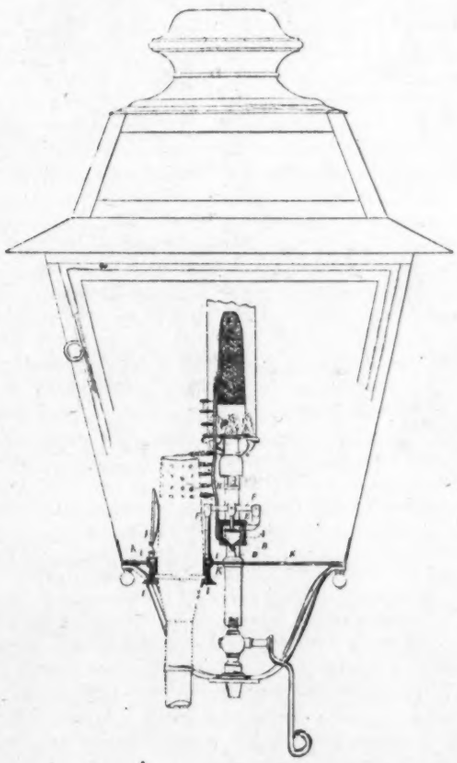


Fig. 1.

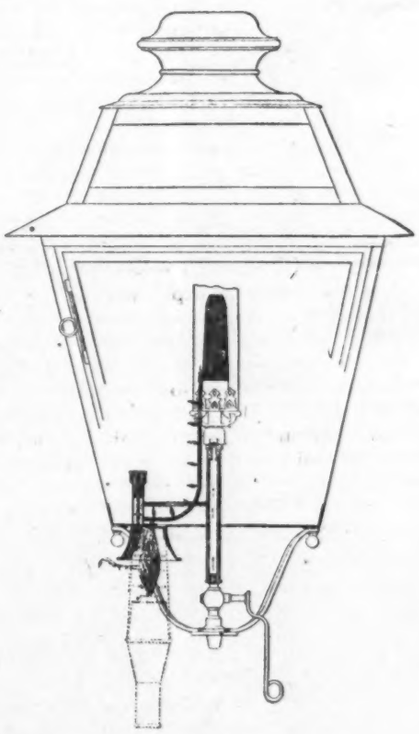


Fig. 2.

The Auguet Lamp Lighting Arrangement.

Ignition is effected in the following manner: The lamplighter turns on the gas with his torch, and then places the end of it in the cup. He next presses it upwards, resting the top against the button which bears upon the spiral spring. The valve rises, and allows the gas to enter the lower part of the distributing tube and feed the igniting tube which is in contact with the flame of the torch; and the burner is lit instantaneously. The lamplighter removes the torch, which, by ceasing to press against the button, allows the valve to fall on to its seat. The gas is then cut off from the igniting tube, and the light extinguished. The whole of this is done by a single movement.

Cowan's Coin-Freed Gas Meter.

British Letters Patent (No. 23,248) were recently issued to Mr. William Cowan, of the Buccleuch Street Works, Edinburgh, for improvements in "coin-freed" meters. According to the specification, the invention consists of a coin pocket which is always turned in one direction, and of a price varying mechanism. Referring to Figs. 1 and 2, these show, respectively, a rear elevation of the new coin pocket and a sectional elevation of the same. The coin pocket, *A*, is mounted upon the usual shaft, fitted with a handle outside the casing for turning the pocket. Upon the shaft there is also mounted a crown wheel which gears through a long pinion with any type of gas measuring out device. In this form the change in price is provided for by using different sizes of crown wheels, in the ordinary way. The coin receiver is of disk form, and has a through passage cut in it at right angles to the shaft, and of such width as to allow smaller coins than those for which the meter is intended to pass through. At one side the disk pocket is slotted out to receive a 2-armed pawl, *B*, which is pivoted on the disk, and is normally held, by a spring, *C*, with one arm, *D*, projecting into the coin passage, *E*, and the other arm, *F*, projecting beyond the circumference of the disk pocket (Fig. 1); the spring being attached to a pin fixed on the pawl and resting against an abutment formed by the extremity of a recess, *G*, in the disc. (Instead of using a spring the lever may be so weighted as to secure the same result.) The shoot, *H*, for guiding the coin into the passage, *E*, is formed as part of a segmental roof *K*.

When there is no coin in the pocket the arm *F*, of the pawl comes against the lower edge, *L*, of the shoot and prevents the coin pocket being turned. On the other hand, when a coin is present and the handle is turned one part of the circumference of the coin comes against the arm, *D*, of the pawl, and the opposite part comes against the edge, *M*, of the shoot. As the handle is turned the coin must pass underneath the segmental roof, *K*, which causes the arm, *F*, of the pawl to be withdrawn within the circumference of the disk, enabling it to clear the edge, *L*, and permitting a complete revolution to be made. When the coin has passed the lower end of the segmental roof it drops out, allowing the pawl to fall back into its original position, so that the coin pocket cannot be rotated again till another coin has been inserted. Backward rotation of the pocket is prevented in the usual way, by a ratchet wheel, *N*, and pawl, *O*, and the ratchet wheel has a part, *P*, of its periphery uncut, which allows sufficient play to bring the coin passage, *E*, into alignment with the fixed shoot, *H*.

Figs. 3, 4, 5 and 6 show the application of the new coin pocket to a prepayment mechanism in which the movable platform and pointer and scale price varying device described in the applicant's patent No. 18,727 of 1899 are employed. Fig. 3 is a plan, Figs. 4, 5 and 6 are sections. The coin receiver, *A*, is mounted on the same axis as the measuring out ratchet wheel, *R*, and has attached to it an arm, *S*, which carries a pivotally mounted pawl, *T*. This pawl is held forward by a spring (Figs. 5 and 6) attached to the side of the coin receiver, and it is fitted with a pin *U*, by means of which the tooth, *V*, is kept out of engagement with the measuring out wheel, *R*, when traveling round the portion of the wheel covered by the measuring out platforms, *W* and *Y*, of the price varying device. The ratchet wheel *N*, with which the pawl engages for preventing backward rotation of the handle should have the pitch of its teeth so proportioned as to prevent "pumping," that is, turning of the measuring wheel *R*, by working the ratchet wheel backwards and forwards in the space of a tooth, during the measuring out portion of the forward travel of the handle, when the pawl tooth *V*, is in engagement with the teeth of the measuring wheel *R*.

Fig. 1.

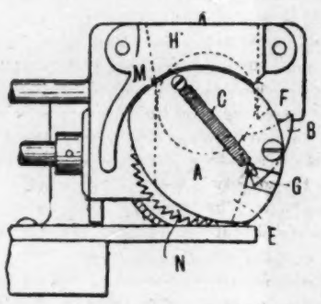


Fig. 3

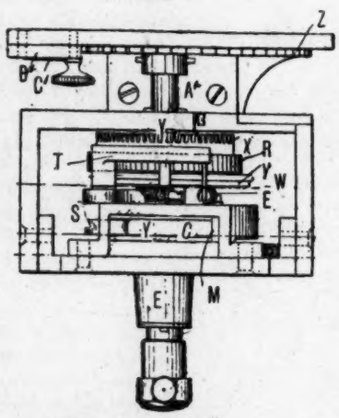


Fig. 5.

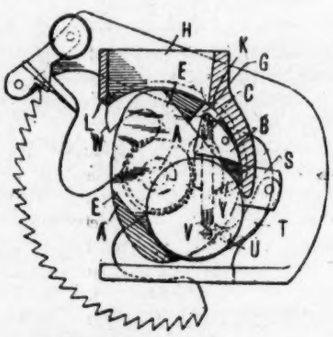


Fig. 2.

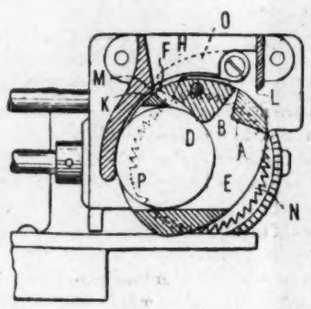


Fig. 4.

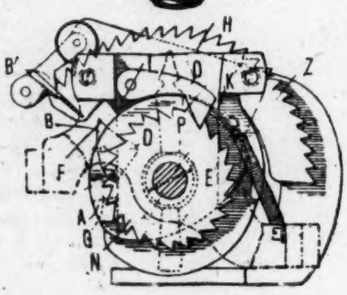
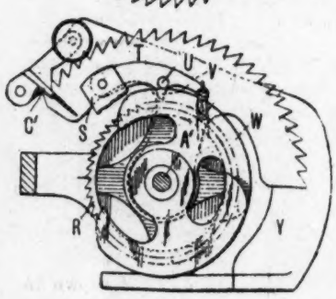


Fig. 6.



The measuring out wheel *R*, has formed on its face a crown wheel *X*, which gears with a bevel wheel (not shown) fixed on the extremity of a shaft provided with a screw member of a screw-nut gas measuring out device of the kind described in Patent No. 18,727 of 1899.

Figs. 3 to 6 also show a new price varying device. A scale in the form of a segment *Z*, is attached to the extremity of a shaft *A'*, upon which the measuring out wheel *R*, and the fixed platform *W*, of the price varying device are sleeved. The movable platform *Y*, is secured to the inner extremity of the shaft *A'*, which is axial with, and forms a bearing, for one end of the coin pocket shaft. The periphery of the segmental scale is provided with ratchet teeth into which drops the tooth of a pawl *B'*, pivoted on the fixed frame of the mechanism. The free extremity of this pawl is drilled to receive a screw, by means of which the pawl may be fixed to the frame for locking the scale in any desired position. In order to indicate the quantity of gas to be supplied in exchange for a coin, figures are provided on the ratchet segment, which figures may be arranged in two circles, one within the other, every alternate figure being situated on the circumference of the inner

circle, as shown in Fig. 5. The length of the segmental scale which is required for a given range of price variation is thus diminished. The pawl B', carries a fixed index or pointer C', to which the figure indicating the quantity of gas supplied in exchange for a given coin is adjusted by movement of the segmental scale, which at the same time rotates the platform Y, relatively to the fixed platform W, so as to alter the effective part of the travel of the pawl T.

The Present Aspect of the Labor Question.

[By Mr. Egbert P. Watson, in *Iron Age*.]

The problem of the 20th century the world over is the relation of workman and employer, and strenuous efforts are being made to arrive at even a temporary solution of it, for the subject is so vast in all of its aspects that it cannot be settled by the agreements and resolutions of any body of men at one meeting, no matter how earnest and conscientious they may be. One reason for this view is that there are but very few men in the world at large who are capable of grappling with such questions and deciding them within the limits of any meeting. Judicial minds there are in plenty, but these are not usually found in the ranks of labor representatives, who must have a voice in the proceedings. From their point of view meetings are called to present considerations to-day which shall go into force to-morrow, and they are impatient of settlements which delay action. This condition is brought about by their callings, in which cause and effect are coincident; if a throttle is opened the engine must start, and legislation should be of the same complexion to meet their approval.

Another reason why the relations between employer and employed cannot be concluded at a sitting is found in the fact that up to this time the representatives of labor have not been able to "deliver the goods," as the saying is. They have agreed to certain points in controversies only to find, when they were laid before an association meeting exclusively, that the rank and file repudiated them, and, so far as they are concerned, the time of the arbiters has been wasted, for nothing has been gained except points in an empty argument between the contestants on both sides. If there are restrictions and concessions that the workmen do not like they feel that that have been overreached, and repudiate everything; then the old order of procedure obtains again. A tendency of these labor conventions, too, is that delegates from the workmen's side feel that they have the opportunity of their lives to show what is in them as orators, and, instead of keeping to the argument, indulge in vague hints and covert threats as to what they can do, and will do if affairs are not legislated to their liking. They understand conventions which settle all points claimed for the workmen, and call them "victories," but those which contain concessions upon their side they reject arbitrarily, or at the least they will not confirm and adhere to them.

This has been shown time and again at conventions which it was hoped would settle controversies of the kind mentioned for a while at least, but this seems to have been a futile hope, for if this had been the result the present convention, recently in session, would not be thresh ing the same straw over again. It is shown also by the more or less aggressive attitude of labor unions to those who are not of them. Independent workmen were never more harassed than they are at this writing, and in some cities in the country they have been forced to join the unions or see their families suffer. They have no choice, for in small towns the employers cannot protect themselves even, let alone help others to fight aggressions; they are in no condition to do without work, and must employ union workmen or none. There are many men, not capitalists and without shops, who take contracts and hire others to help them who belong to unions also. When the work is in progress a walking delegate comes around and inquires the price the work was taken at; if it is below the union rate for such jobs the contractor is reported to the union, and a fine of from $25 to $30 is inflicted on him; very oftem more than the profit on the transaction. The non-union men were never in worse plight than at this time, and the outlook for their relief, right to engage where they can, is very remote. Just what benefit they will get from conventions it is difficult to see. Recognition of the abstract principle that this is a free country and everyone who really wants to work can do so does not seem to help them much; all that is conveyed by the Constitution of the United States. What is urgently needed is some plan to insure the peaceable occupation of their rights, and that is now denied them.

But they do feel that at some time, more or less remote possibly, they intend to prosecute their callings in their own way, "peaceably if they can, forcibly if they must." If the various conversations that I have had with non-union men were not misunderstood by me in their purport, they are very much in earnest upon this point; what is particularly irksome to them is the fact that as individuals their views are ignored, and that under the union rules they are not allowed to even choose their own jobs. If a contractor needs workmen he cannot go to men of his trade whom he desires as hands, but must apply to the local union, with a statement of the number of men required, when the union will send them from those who are unemployed at the time. Non-union men who are compelled to join associations have no love for them and do not believe in their platforms, but "self-preservation is the first law of nature" and it is not possible to exist without them.

Concerning the determination of the labor associations to rule or ruin one instance may be cited. In a certain Connecticut town of about 13,000 inhabitants, who are almost wholly operatives of one kind or another, most of them were concerned in a very stubborn strike last summer, and were only defeated by the State laws enforced by an impartial judge. These laws forbid the workmen to interfere with the business of others by picketing or in any other way; when the strikers broke these laws injunctions were issued against them as a warning to desist. No attention was paid to the injunctions, but the practices of the strikers continued, whereupon they were arrested and brought into court in contempt of it. Their counsel denied and still further defied the court to punish them, which was met with summary proceedings by the judge aforesaid, who at once found the strikers guilty as charged and fined $500 each, issuing warrants to the Sheriff of the county to levy on the property of the strikers and collect the sums due the State. Unfortunately for the chief conspirators, as they may be called, most of them had homes for which they had worked hard a long time, and when they fonnd that they were to be sold up they surrendered incontinently. It must not be supposed, however, that this stopped the schemes of the strikers, for at the next town election they chose the entire board of civic authorities from their own ranks, and thence forward had, as they supposed, matters in their own control; but when the new officers assumed their seats they were found perfectly ignorant of the conduct of affairs. Transferred directly from the shop to chairs of authority they found "the seats of the mighty" harder than they expected and civic routine was at a deadlock. The treasurer announced that there was no money in the treasury and that he could not pay the policemen, teachers in public schools or any tradesmen for supplies. As these last had no confidence in the newly elected officers they would not trust the city, and for a similar reason—no credit—the banks refused to advance money, as they had previousiy. The treasurer was ordered by the mayor to "go out and get some money," but as no means were suggested as to how he was to obtain it, he is, possibly, still without funds. This experience may deter other workmen from similar courses, but perhaps not, for trade unions are machines which have wheels within wheels and are slow to learn how to succeed by failure. There are always a number of hot headed members who willingly continue to butt their heads against stone walls in full faith that they can destroy them if they only keep on long enough.

It may be asked that if trades unions have no faith in conventions to redress alleged grievances, or to obtain the ends they are striving for, why do they continue to send representatives to them and spend much money to appear in them? The answer is that by attending conventions they get publicity to advertise themselves and keep before the country at large, and, further, they may gain some minor points which they had not enjoyed before. Any gain is an advance, and there is an opportunity for the trade press they control to assert that the employers conceded all that was demanded by them.

Trades unionists are by no means passive, but always militant toward full control of their end of manufacturing, and although no great strikes are in force at the present time, there is a condition of unrest among the trades which is constantly incited and fostered by the unions themselves. This same aspect pervades workingmen everywhere, and the situation is even worse abroad than it is in this country, for in England it seems that union workmen are now deliberately loafing over their jobs and so curtailing the output that they really work but half of the time when they are in the shop, and do not even put in an appearance there for more than four days out of the six. Not only this, but the foremen have two masters to serve—their employers, who pay them for their time, and the members of the unions they must belong to, who overhaul them at meetings for what they may have ordered the members to do that was distasteful to them the day previous.

The attitude toward labor saving machines is distinctly hostile; they simply stubbornly oppose new appliances in all lines of trade, and deliberately destroyed, in Northampton, a shoemaking center, some lasting machines because they dispensed with the services of three men.

Wherever machines are tolerated at all they are permitted only upon a stipulation that the same number of men shall be employed as before, and the rate of them restricted to the hand labor ability, so that no advantage whatever is gained by the employers. It is stated in the *Times* (London) that a Tabor molding machine was installed in the town of Hull, and the firm offered to allow their molders to run it, notwithstanding the fact that laborers do that work in this country, but the molders refused unless they were allowed laborers in addition to their own work. As this was impossible the firm then engaged laborers themselves, when the molders promptly struck, and the matter was only settled by the interference of city officials. In the face of this and similar complications it is easy to see that dissertations upon political economy do not reach the subject and that it will take a long time to educate the work people of England to understand the questions involved.

It is also easy to say that such a state of affairs will never obtain in this country, but is that certain? Our men are too intelligent, and know the true position of labor saving machinery in the arts, for many of them have made, and are making at this writing, fortunes of greater or less sums by the aid of these very machines and processes, but the actions of trades unions everywhere, in this country as well as others, are not governed by logical conclusions or arrived at by argument, and there is no insurance that a decided stand may not be taken here against the further use of new machinery which dispenses with men.

In any event, whatever aspect matters may assume, it is most desirable that unions should by a convention or conventions of their own state exactly what they want, or what they are striving for, to the end that capitalists, or contractors, should know what they have to expect to encounter in carrying out their undertakings. Without a precise definition of intentions there is uncertainty and loss for both parties in interest, where with it there would be no obstacles to the success of any given job. This has been done before, and the platform of principles, demands, let us say, promptly ignored when unfavorable conditions arose to the unions. The Amalgamated Association did this very thing last summer, as to a portion of its constituency, but another portion stood by their agreements, and arguing from this action it is not too much to feel that it will occur again and be the rule instead of the exception hereafter. Employers generally concede the abstract right of workmen to form unions to further their ends in all legitimate ways without injury to others who hold opposite views, so it is not to the unions themselves that objections are made, but to the fact that they deem it a part of their functions to dictate to non-union men whether they shall work at all.

The New Jersey Board of Arbitration in labor difficulties has been dissolved, there being no cause for its continuation; not a single case has been referred to it during the 12 months it existed, which fact attests that it is unpopular. Conventions of a mixed character, although they may not possess the power to decide upon the facts presented, are *de facto* arbitrators none the less, and the character of the members composing the present committee should be fruitful of good, if their findings are respected and lived up to. There are 36 men on this committee, 12 of whom are from union associations, 12 from the largest employers of labor, and 12 citizens without interest or affiliation with the other representatives.

It is earnestly to be hoped that their labors will bring forth good fruit.

The Velocity of Steam.

[By Mr. W. H. Wakeman, in *Electricity*.]

The statement has been made, and evidently believed by some engineers, that if a round hole 1 inch in diameter should be bored in the shell of a tubular boiler, above the water line, it would be impossible to make steam fast enough in that boiler to maintain a working pressure. The size of the pressure was not given when I heard the above statement, except that it meant any boiler in ordinary stationary practice.

As many engineers have never given their attention to such matters, except in a very general way, I have concluded to make a sort of test case of this in order that the truth or falsity of it may be demonstrated so far as it can be by the application of well known principles, or in other words, it will be proved from a theoretical standpoint.

It is evident that our first business is to find how fast steam travels under these conditions, and here is a question on which the doctors seem to disagree, to use a common expression, for its velocity is stated at 900 feet per second by some writers, at 1,450 by others, while the highest statement I have read places it at 3,500 feet.

I can understand the cause of difference between the two former, but the latter surpasses my comprehension, therefore I leave it as a mystery for somebody else to solve.

It is an axiom that the velocity of steam as it emerges from a hole is due to the pressure behind which forces it out against atmospheric, or other pressure, but just how this pressure affects it is a point for consideration.

The velocity of steam is influenced in the same way that water is, when coming out of an orifice, at least to a certain extent. If we take a U-shaped pipe, both sides of which are 100 feet high, place it in a vertical position and fill it with water, the pressure at the base will be directly in the height of the columns of water, and it may be determined by multiplying the height by .434 and $100 \times .434 = 43.4$ pounds. If we now proceed to cut off one side of this pipe at a distance of 58 feet from the top, the pressure under which the water will flow from it, provided the longer part is kept full, is 58 per cent. of the full pressure and $43.4 \times 58 = 25.2$ pounds, because it is due to the difference in height between the two sides of pipe.

We may prove this by calculating the pressure due to the height of each and substracting the lower and the higher. Cutting off 58 leaves 42 feet and $42 \times .434 = 18.2$. Then $43.4 - 18.2 = 25.2$ pounds.

This illustration is introduced to show that in order to use the rule to be explained later on the lower pressure must not be more than 58 per cent. of the higher, but it may be any lower pressure without detriment.

Applying this to ordinary conditions where steam is blown into the air at sea level, we find that the lowest boiler pressure to be used is 11 pounds by the gauge, which is determined as follows:

Atmospheric pressure is taken at 15 pounds and as this is 58 per cent. of some number, we may determine what that is by dividing 15 by .58 when the quotient is 26 pounds absolute, or 11 pounds by the gauge. Inasmuch as this is the least difference to be allowed it naturally follows that we may raise the boiler pressure as much as we desire without impairing the value of the rule for the velocity. It also follows that the lower pressure may be reduced to any point desirable, therefore if the steam is discharged into a vacuum the rule still holds good.

I may remark here that this does not seem logical, but it is the results of direct experiments and these cannot be disputed.

It is necessary to give the laws which govern the action of falling bodies some attention, as the velocity of water coming out of a pipe, or of steam blown into the air, is determined by the same law which gives velocity to a common ball when dropped from the top of a church steeple. Friction modifies the results in all cases, but does not repudiate the law.

If a weight be dropped from an elevated place, under conditions which prevent friction, it will fall 16.1 feet in one second, but it started from rest, therefore its final velocity must be double its whole travel, or 32.2 feet, as its motion is uniformly accelerated, and this will give it a velocity of 64.4 feet at the end of the next second. At the end of the third it will be 96.6 feet and for the fourth it will be 128.8 feet.

If it falls 16.1 feet during the first second, and its motion is uniformly accelerated, it will fall 32.2 feet during the next with the acceleration due to the first, to which must be added the 16.1 feet due to gravity, making 48.3 feet in all during that second, or 64.4 feet for two seconds, so that by squaring the time in seconds and multiplying by 16.1 the height may be determined.

It follows that if we know the height we can determine the velocity which is the point of more especial interest in this connection. The rule for this is to find the square root of the height in feet, and multiply it by 8. This rule is based on the principles above referred to.

Suppose that we have a vertical pipe of unknown height, full of water, and we wish to know how fast this water will run out through an opening at the bottom. Connecting a gauge to the bottom we note that the pointer indicates 43.4 pounds. Proceeding to multiply this by 2.3 the height is found to be 100 feet.

The square root of 100 is 10, and $8 \times 10 = 80$ feet per second. Study of the foregoing leads to a clear understanding of the rule for the velocity of steam as it is based on the same principles. The steam gauge on a boiler indicates the pressure the same as the gauge on the column of water does, and from this we may determine the height of a column of steam that would produce an equal pressure, if held in a vertical pipe, provided the lower part of it was filled with steam of density equal to that in the upper part of it. If it was practical to erect such a column, the lower part of it would be much more dense, as the weight resting upon it would produce this result, but it is assumed to be of equal density throughout.

Suppose that the absolute pressure is 100 pounds, and we wish to determine the corresponding height of a column of steam 1 inch square.

A cubic foot of steam at 100 pounds pressure weighs .2307 pound. If it were to be divided into columns 1 inch square, 1 foot long and set one upon the other it would stand 144 feet high, therefore a column 144 feet high weighs .2307. $144 \div .2307 = 624.18$ feet required to weigh 1 pound and $62.418 \times 100 = 62,418$ feet required to weigh 100 pounds.

Put into the form of a rule this reads as follows: Divide 144 by the weight of 1 cubic foot, and multiply the quotient by the given absolute pressure.

The square root of 62,418 is 249.8.

It is not proper to multiply this by 8 as in the case of water, but by 3.6, as experiments have demonstrated this to be correct. Then $249.8 \times 3.6 = 899.28$ feet per second, which fully accounts for the speed of 900 feet mentioned in the first part of this article.

This is the rate before expansion takes place, but the instant that pressure is relieved, it begins to expand to atmospheric pressure at a ratio of 1.624, therefore the velocity is increased at the same rate, and $899.28 \times 1.624 = 1,460$ feet, which accounts for the greater speed given by some writers.

When calculating the weight of steam discharged per hour from a boiler there are at least two ways of doing it, one of which is to take the velocity at the expanded rate, and the weight per cubic foot at the expanded pressure, which in this case is 15 pounds.

The other is to take the velocity due to the pressure, or, in other words, to the height, as already explained, without expansion, and the weight at boiler pressure, which plan will be adopted here.

A round hole 1 inch in diameter contains .7854 square inch, and the length of the stream of steam coming out in one second is 900 feet, or 10,800 inches.

Then $10,800 \times .7854 \div 1,728 = 4.91$ cubic feet per second, or 17,676 cubic feet per hour, which weighs .2307 pounds per cubic foot. This makes $17,676 \times .2307 = 4,077$ pounds of steam per hour.

This will not be realized from an ordinary hole drilled in the shell, because it does not give the most efficient form.

If the hole was reamed out from the inside, so as to make a bell shaped orifice, it would give the best result, but where a straight hole is drilled and nothing more done to it, we cannot expect to get more than .8 of the full capacity and $4,077 \times .8 = 3,261$ pounds, or more than 100-horse power if the feed water is supplied at 100° F.

A tubular boiler 66 inches in diameter with 100 three-inch tubes 15 feet long will supply this steam, if well set where there is a strong draft, using good coal. A smaller boiler can be made to do it, but it is not advisable.

Asphalt Conduits.

The accompanying illustrations show a system of asphalt conduit and troughing manufactured by the Howard Conduit Company, Limited, of Trafford Park, Manchester. Asphalt is particularly suitable for pipes or conduits, as it is impervious to water and air, resists wear and acids, is an electrical insulator and expels vermin. It is durable and easily repaired, and so ductile that it will yield to any ordinary pressure without cracking. It is unaffected by frost, and though softened by heat at about 125° F. does not disintegrate even at 350° F., and upon regaining its normal temperature has lost none of its desirable qualities.

Difficulties of manufacture have hitherto prevented the use of asphalt for pipes, but the Howard Company claims that it has overcome these. The process of manufacture consists in placing the hot asphalt in a sheet iron pipe, which is revolved rapidly. Under the influence of the centrifugal force the asphalt spreads into a cylinder of uniform thickness, and is pressed into a solid mass. The heavier sediments are left on the outside of the pipe, forming a strong outer skin, and the lighter matter forms a smooth inner surface. The pressure developed by centrifugal force in a 3-inch pipe revolving at 300 r.p.m. amounts to 10.6 pounds per pound of asphalt. To prevent alteration of shape there is combined with the asphalt a spiral of galvanized iron, imbedded in the material and thus protected against oxidation.

The labor in making joints is naturally very slight. A cast iron block of suitable shape is heated in a portable fire and applied between the two ends to be joined. As soon as the asphalt is sufficiently warmed the two ends are pressed together firmly and left to cool, a thoroughly welded joint being thus produced.

Asphalt troughing for use on the solid system is made on the same principle as the conduit, but without the spiral, and is pressed into rectangular shape. The cable is laid directly in the bottom of the trough without supporting clips; a small quantity of bitumen is then flowed into the trough, which is sufficient to cover the cables. The remaining

Fig. 1.—Laying Asphalt Conduits.

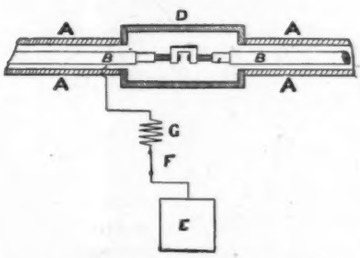


Fig. 2.—Longitudinal Section of Condui

pace is filled with asphalt rock, which can be arched, thus forming a cover sufficient to protect the cable from external damage.

In the accompanying illustration *D* represents an iron joint box lined with asphalt, connecting two lengths of lead-covered cable *B* laid in the asphalt trough *A*, the cable covering being connected to earth through the resistance *G* and the fuse *F*. In case of a failure of a cable causing a short circuit to the lead, and thus to the earth,, the cable in the ordinary case is burned out, or the circuit breaker is opened, causing considerable trouble, especially in railway circuits. In the present system the fuse *F* in the section in which the fault occurs is blown and the lead covering is thus insulated from earth by the asphalt troughing. The cable can still be utilized until a convenient time for repairing the fault, the position of which is easily found by an inspection of the various fuse blocks. The resistance *G* is intended to prevent the flow of any electrolytic currents in sufficient strength to injure the lead.

Best Return of Electricity to Power House.

Mr. E. G. Connette, in an interesting paper read by him at the last meeting of the American Street Railway Association, gave his experience concerning different methods of electric current returning to the power houses of street railways. Summing up Mr. Cornnett said:

In the early days of telephone exchanges the ground was used as a return circuit, and we are all familiar with the inefficient and poor telephone service while this state of things continued. The service was disturbed by the trolley currents and other influences until finally the telephone exchanges were forced to put up a metallic return in order to save trouble, annoyance and disturbances to their service, and I believe after a trial it was discovered that the expense of putting up the metallic return was more than compensated for by the improvement in the efficiency of their service, and was money well invested.

It is, therefore, the opinion of the writer that "the best manner and mode of conducting the return circuit to the power house" is by using practically a jointless and independant metallic return, connected to each rail, and the connections made with ample surface contact and absolutely water tight, on account of the chemical action, which is likely to take place between the copper rivet and the steel rail; the rivet should be covered with a thick coating of lead, solder or tin; the best connection which can be used, if the faciiities are available, is to electrically weld the connection from the auxillary ground wire to the center of each rail, and, I dare say, that even with the extra initial cost

of an independent ground wire it will result economically in the long run.

If an independent metallic return circuit was the custom now there would be no necessity for a paper to be written on the subject; there would be no more need of discussing the subject of rail bonding or of electrolysis, or of the best methods of discovering bad connections in the return circuit, and the expenditure of a large amount of money for expert investigation and advice to cure the bad results of the present imperfect system of conducting the return circuit to the power house; and the amount saved by loss of power, cost of rail bonds and labor of renewals, tests and investigations, as well as the trouble and expense incident to electrolytic action will be more than ample to ground return.

Cast iron joints and electrically welded plates on the joints make the rails of the track practically a jointless metallic circuit as a conveyance for the electric current, but the very large number of joints in the rails of the tracks makes the certainty of an unbroken and continuous metallic circuit a doubtful proposition, as the wear and tear of heavy traffic, and the expansion and contraction of the metal will, in the course of time, produce results which may very materially impair the efficiency of the joints as a perfect conductor, and it appears to the writer that it is just as essential to have a conductor as perfect and as efficient in carrying capacity, to convey the current back to the power house as is used to convey the current from the power house to the car, and if this were the case, there would be no more troubles with the return circuit. I do not advocate a double trolley, because of the difficulties which are well known to street railway people; but an independent metallic return used in connection with the single trolley system is not as expensive to install as the double trolley spstem, and, practically, obviates all the troubles incident to the ground return where the rails with bonded joints are used for the return circuit.

The Petroleum Industry of California.[1]

[By George H. Eldridge.]

There are at present many phases to the petroleum industry of California as viewed by the general producer, but none is of greater interest than the market. This depends upon the railroads, the refiners and the general consumers, and in a considerable degree upon one or two of the larger companies that may not only buy for refining purposes, but for transportation and storage against future higher prices with the intention of reselling.

The demand by the railways is large and continuous, but they themselves are large producers, in addition to purchasing on long time contracts at figures very remunerative to the seller. It seems quite probable that in the renewal of contracts, fuel oil will be obtained at materially lower prices, but the demand will unquestionably increase as the replacement of coal burning with oil burning locomotives proceeds and the development of traffic attendant upon the natural conditions of commerce on the Pacific Coast is brought about.

The refiners also are both producers and consumers. The larger companies, however, are extensive buyers of oil as low in gravity as 14° B., and to care for the product, in one field alone—the Kern River—are erecting tanks of an immediate aggregate capacity of over 1,000,000 barrels, with the apparent intention of doubling this in the near future. This work has doubtless been entered upon only after most careful consideration of commercial and technical conditions, and with the laying of pipe lines to the seaboard, constitutes a most encouraging feature bearing upon the future of the industry. The accumulation, however, of great quantities of petroleum in a few hands is very likely to have a distinct influence upon prices, a factor to be at all times considered by those engaged in or entering upon the production of oil.

The use of petroleum as a fuel among the general industries of the State is markedly extending, and at the present time shipments are being made to the Hawaiian islands, where a saving of between $2 and $3 per ton of coal formerly used is the result attained by the planters in the change.

To one familiar with the relation of fuel supply to the commercial development of a region, there is but one conclusion as to the future of the petroleum industry of the Pacific Coast.

The prices of fuel petroleum at the wells in 1901 that have come to the writer's knowledge vary from 15 cents to $1.42 per barrel, the latter, a single instance based upon a long standing contract. Recently there has been reported a contract of several million barrels extending over a period of years at 25 cents at the well, and this may prove a not uncommon figure of to-day. The lowest price, 15 cents, is accepted chiefly by those whose capital is limited and who are required by the terms of their lease or otherwise to prosecute drilling uninterruptedly. This price is, however, for fuel oil of 12° B. to 15° B., oils of lighter gravity but of the fuel class bringing a somewhat higher figure. The petroleums of 28° B. to 40° B. command, of course, a much higher price. These go to the refineries. A satisfactory review of the year's prices of petroleum is most difficult, so closely guarded are the figures by both buyer and seller.

The present cost of producing a barrel of fuel oil from wells 800 to 1,400 feet deep, exclusive of the cost of the well, is, according to the best authorities, between 10 and 15 cents, these being the limits given the writer by some of the larger and older companies. Five or six cents is not infrequently reported as the "cost of production!" but this does not include interest, repairs, enforced idleness of a well, loss by fire or wind, or a sinking fund against the exhaustion of the strata. Economies will sooner or later come through the utilization of natural gas for pumping; through the increased efficiency of labor; through improvement in management, with acquired experience; and through consolidation, which is already underway and will rank first in the reduction of expenses. Opportunities for improvement of the technical side of the industry are glaringly conspicuous to the most casual observer, but the condition is that attendant upon nearly all new mining enterprises. It is of interest that in all the fields success has been attained in proportion to the business acumen of the management; the careful study of every phase of the industry; the preservation of the most complete well records for future reference; the early investigation of important technical questions, and alertness in placing contracts.

In some of the older fields, which are also fields of lightly producing wells, 10 to 15 barrels, and high gravity oil, 20° B. to 40° B., economics have been advantageously practiced for a long time. Gas is altogether employed in pumping; the wells are operated as far as possible from central plants; labor is reduced to a minimum; and the management is upon conservative lines, founded upon experience.

The values of California oil lands vary widely for different fields; different parts of the same field; even for the different quarter sections. Although proven territory has by far the highest first cost, the writer believes with an advantageous lease it is the cheapest. Leases, however, are reported as having been made upon the basis of a royalty of 50 per cent. of the production and an agreement on the part of the lessee to bore, in some instances, as high as 8 or 10 wells annually for a period of three years. Such a lease is likely to prove unremunerative except in the richest territory. Most of the leases are far more advantageous than this.

In the Kern River field the oil producing strata amount locally to over 400 feet, all available; the wells of the same locality yield from 150 to 250 barrels per day—in some instances more. As a means of estimating values, the yield of a stratum saturated to 10 per cent. of its volume may be taken at 777 barrels per acre-foot. The writer's examination of exposed bituminous sandstones in California two years since leads him to believe this conservative; in several instances 14 to 16 per cent. were found present in considerable bodies of sand. In the past year especially selected land in the Kern River district has been reported as valued at $20,000 per acre. This would require 160,000 barrels of oil netting 12½ cents per barrel to equalize zhe purchase price. approximately the product of 200 acre-feet at a saturation of 10 per cent. by volume.

The developments of the past year have been more marked in the San Joaquin Valley than in the southern fields of California, although in all of the latter advance is indicated by a number of new wells. In the San Joaquin Valley the Middle Neocene sandstones have proved wonderfully productive, the wells ranging from 25 to 700 barrels a day, of an oil varying for the different fields from 12° B. to 20° B. In most of the Valley fields the formation lies at a gentle angle of dip, the McKittrick, where the strata may be even overturned, being the single exception.

In Southern California, the fields along the Santa Clara Valley show the greatest disturbance of the strata, fold after fold occurring in rapid succession, with oil fields developed along several of the anticlinal axes.

The United States Geological Survey has in the latter half of 1901 entered upon the examination and survey of the California oil fields. General topographic maps of many of the southern districts have already been prepared, and the geological survey, stratigraphic and structural, is well underway.

1. *Engineering and Mining Journal.*

Waste of Natural Gas.

"W.," writing on this subject in the *Journal* Franklin Inst., truthfully says that the recklessness with which Americans are prone to use or rather to misuse the products with which nature has so bountifully endowed the country is conspicuously illustrated by the manner in which the vast supplies of natural gas have been carelessly permitted to go to waste.

The State of Indiana, by reason of its geological features, is probably more favorably situated in the matter of natural gas supplies than any of the neighboring States, and the manufacturers of Indiana have availed themselves of the product more extensively than elsewhere, and to their great advantage. From a recent report of the State Geologist, it appears, however, that they will not long enjoy the benefits of this cheap and admirable fuel. He reports that the people of the State not only waste the gas in furnaces, grates and stoves, but through sheer indifference have for years been permitting the gas to escape into the air at the rate of perhaps 20,000,000 cubic feet per day, simply through neglect to cap the wells which have been bored for oil.

Already there are ominous signs of the approaching exhaustion of the gas supply. Originally the gas producing territory embraced 3,000 square miles, to-day it has shrunk to one-half this area. In the beginning of the gas era, the average gas pressure as it issued from the wells was 325 pounds to the square inch; now it does not exceed 200 pounds.

During the past year the gas pressure in the center of the Indiana gas area diminished 30 pounds per square inch. Taking all the circumstances into consideration, the Geologist estimates that at the present rate of consumption, the gas supply will be practically exhausted within 5 years, and he even estimates that it may not last more than one year.

Oddly enough the manufacturers, who should be the most careful conservators of this product, appear to take the matter quite complaisantly, with the knowledge that they can fall back upon petroleum (of which the State is a large producer) as an efficient substitute for the gas fuel.

It is impossible to form an estimate of the enormous quantities of natural gas that have been allowed to go to waste in the oil fields of the United States since the period when deep drilling first tapped the gas reservoirs. It is within bounds to say that for every cubic foot that has been utilized a thousand have been wasted.

In its want of thought for the conservation of this overbountiful gift of nature, Indiana has only imitated the bad example of her neighbors, Pennsylvania and Ohio.

The Present Status of the Question of a Standard of Light.

[A paper read by MR. CLAYTON H. SHARP, before the Am. Inst. Elec. Engineers.]

The situation as regards a standard of luminous intensity has shown in recent years a marked tendency towards simplification and unification.

A number of standards or would-be standards, which were formerly taken seriously, have disappeared from practical use. Of the various candles, the British candle is the only one which survives, and the practical use of it is steadily decreasing. The Carcel lamp is held in much less esteem than formerly. Practice is settling down to the selection of one of two classes of standard, either the pentane standard in one of its forms, or the Hefner amyl.acetate lamp.

The small 1-candle power and 1¼-candle power pentane lamp has proven itself worthy of confidence as a result of thorough investigation in the Reichsanstalt. The 10-candle power pentane lamp is coming into very extensive use by the gas men here and in England, and commends itself by its simplicity of operation, by its relatively high intensity and, as far as is known, by the constancy of its indications. Unfortunately, there is on record no such careful investigation of its properties in this particular as has been made for the smaller pentane lamp and the Hefner lamp.

If gas practice is looking more and more to the pentane standard, electrical practice is looking towards the Hefner lamp. The careful study made in the Reichsanstalt, the adoption of it officially in Germany, the resolutions in its favor by this Institute and by the Geneva Congress of 1898 has served to popularize it and to intrench it strongly.

While the facts enumerated show that great progress, it is not to be assumed that a satisfactory solution of the problem of a standard has been reached. A standard must be as nearly as possible a common denominator of the sources of light in ordinary use. No one integrated source of light can be in all strictness a common denominator for all, on account of the existing differences in quality or color. That light most nearly fulfills this condition which most closely approaches in color the average color tone of the sources of light in use to-day. Now this is much higher than it was a few years ago, due to the extensive introduction of whiter hued sources of light. The standards referred to above stand, as far as color is concerned, about at the bottom of the list, and from this point of view are as bad as possible. Photometric comparisons with them of most modern lights are very uncertain and the results are misleading in that they do not give to the whiter sources credit for the greater visual acuity per candle power which is their due.

It follows that a standard of light of considerably whiter hue than the present ones would be intrinsically better if of equally good qualities in other respects, and it is towards the definition of such a standard that efforts should be directed.

Quite a good deal has already been done in this line. A notable advance has been made by Petavel[1] in his investigation of the Violle platinum unit. He has indicated the precautions which must be taken to secure good results, and has demonstrated that the limits of error may be made quite narrow. The color of this standard is very good. Violle has stated that it is very similar to that of the acetylene flame, but this statement does not seem to be entirely consistent with the known fact that platinum can readily be fused in the acetylene flame.

The studies by Paschen and by Lummer of the theoretically "black" body have indicated a method by which a perfectly definite radiating surface can be secured, and it needs only a sufficiently accurate method of defining the temperature of such a surface to give us a standard of light.

Since, however, the luminous radiation from such a surface increases as a high power of the temperature, a sufficiently accurate method of temperature definition cannot easily be found.

Among the ordinary sources of light, the acetylene flame probably approaches most nearly in color to the average hue. The ease with which this gas can be produced in a good degree of purity and the steadiness and manageability of its flame also commend it for use as a standard.

Violle,[2] Fessenden[3] and Féry[4] have made independent propositions to this end, but no definite standard has as yet been the outcome.

Fessenden showed how a stable flat flame can be produced with this gas employing the method of the converging jets now in common use. He found the flame to be very steady and moderately immune from outside influences. Such a flat flame, with the light from its edges screened off, has been used very successfully by Prof. Nichols[5] in this spectrophotometric investigations of the radiation of carbon. The flame was controlled by measurements of the pressure of the gas.

The proposition of Féry looked to the use of a long, slender flame. He used a bit of thermometer tubing of internal diameter of 0.5 mm. as a jet. With this he found that the luminous intensity of the flame was proportional to the flame height between the limits of 1 cm. and 2.5 cm., that is, he substituted for control by pressure measurements, control by measurement of the flame height.

What is now known of the properties of the acetylene flame indicates that a search for the best method of producing and defining an invariable acetylene flame would be fruitful of valuable results.

It has been proposed to employ as a standard flame one in which a pure gas burns under standard conditions in a pure atmosphere, both of known chemical composition. A practical method of burning pure acetylene in an atmosphere of pure oxygen has been found, as well as direct and inter-checking methods for the control of such a flame, but the investigation has not led to any definite result.

Until a more satisfactory standard is introduced, photometrists are practically limited to the choice of either a pentane standard or the Hefner lamp as primary standards. An incandescent lamp carefully seasoned and measured furnishes for most purposes a thoroughly satisfactory secondary standard, and we are looking forward to the time when the National Standardizing Bureau will establish an authoritative standard and will measure and will certify to lamps sent to them for this purpose.

1. Proc. Roy. Soc., Vol. LXV., p. 481, 1900.
2. "Comptes Rendus," Vol. 122, p. 79, 1896.
3. Trans., A.I.E.E., Vol. XII., p. 500, 1895.
4. "Comptes Rendus," Vol. 126, p. 1,122, 1898.
5. "Physical Review," Aug. and Oct., 1901.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE Committee on Gas, Electricity and Water Supply, for the Assembly of New York during the current year, as named by Speaker Dixon, is as appended: James H. Apgar, Richard Gardiner, Andrew J. McMillan, Edwin S. Hanford, Charles F. Brooks, Thomas D. Lewis, Frank C. Platt, Charles H. Cotton, Frederick D. Traub, Daniel W. Moran, John McKeown, James J. Fitzgerald and Leo. Ph. Ulmann.

THE United Gas Improvement Company has been awarded a contract by the New Haven (Conn.) Gas Light Company for the installation of a new water gas plant. The construction is to be of the contracting Company's well-known standard double-superheater type of Lowe apparatus, and its capacity is rated to 3,000,000 cubic feet per day. The plant will be a model one.

AT the annual meeting of the Burlington (N. J.) Gas Light Company the following officers were elected: President, J. Howard Pugh; Vice-President, M. J. Drummond; Treasurer and Secretary, John J. Pulleyn. Mr. J. Fred. Seamon, formerly General Manager of the Rockville (Conn.) Gas and Electric Light Company, has been appointed General Manager. During the last year the plant has been reconstructed and 26 miles of mains have been laid, with the result that gas is now being supplied to the outlying districts of East Burlington, Edgewater Park, Beverly and Delanco. The increase in sendout for December, 1901, as compared with that for the corresponding month of 1900, amounted to 123 per cent. The works' improvements include 3 benches of 6's, constructed by Messrs. J. H. Gautier & Company, of Jersey City, N. J., of the Flemming half depth furnace type; also, tar extractor, condenser, scrubber, purifiers, station meter and Connelly automatic governor. These additions and improvements necessitated the construction of a new coal shed and a general remodelling of the buildings, together with the placing of a new retort house roof. The works are now in odd (and favorable) contrast with the old plant as it was in 1899. The extension was designed and supervised by Mr. Frederick W. Floyd, engineer to the gas works department of the Quintard Iron Works of this city.

MR. RALPH WOODWARD, who has had charge for the American Gas Company of the construction of the new plant for the Pittsfield (Mass.) Coal Gas Company, has been appointed General Manager of the Pittsfield concern. Mr. John F. Dunbar remains with the Company as Superintendent of its distributing division. Mr. William R. Plunkett will as heretofore carry on the details of the Company's office work.

MESSRS. W. DIETERLE, J. H. Simms, Joseph Reed, D. F. Carter and Lawrence Lawson have organized the Pomona (Cal.) Gas Company. It is capitalized in $100,000.

MR. ANTHONY N. BRADY, President of the Municipal Gas Company, Albany, N. Y., has been authorized by the Board of Directors to make the following announcement: "In the cities of Albany and Watervliet, commencing the end of the current quarter—viz., March 1, 1902—the price of gas used for illuminating purposes will be $1.30 per 1,000 cubic feet, and for gas used for fuel purposes $1 per 1,000 cubic feet."

THE proprietors of the Troy (N.Y.) Gas Company, whose interests are largely identified with the ownership of the Albany Company, have notified the residents that from March 1st., the selling rate for illuminating gas will be $1.30 per 1,000, the rate for a fuel supply to be $1 per 1,000.

THE authorities of Wilmington, Del., have awarded contracts for the public lighting of that place for a term of 10 years, at the following prices: Welsbach Street Lighting Company, of America, 516 lamps, at $25.75 per lamp per annum; the Wilmington City Electric Company, 269 arc lamps, at $64.92 per lamp per annum; and 557 incandescent lamps (20-candle power) at $14.88 per lamp per annum.

ADVICES from Rutherford, N. J., are to the effect that steps are being taken to reorganize the Gas and Electric Company, of Bergen County, the affairs of which have been in an unsatisfactory way since the failure last summer of the New York banking firm of Henry Marquand & Company. An impression has been created that the Company is insolvent, but the statement has no foundation in fact. The Company is doing an excellent business, and the physical condition of its gas and electric plants is all that could be required. At a recent meeting of the Directors and stockholders the following Committee on Reorganization was appointed: Edwin Gould, William F. Cromwell, William N. Coler, William McKenzie, A. L. St. John, Addison Ely and John C. Eisele. The Committee asks holders of stock to deposit the same with the Bowling Green Trust Company, of this city, on or before the 1st prox., the idea being that all may benefit in equal manner from the outcome of the reorganization proceedings. Negotiable certificates of deposit will be issued for the deposited stock.

MR. WILLIAM F. COCHRAN, President of the Herkimer County (N. Y.) Light and Power Company, died at his home in New York the evening of the 27th ult.

THE plant of the Steelton (Pa.) Home Gas Company is virtually completed, and it is thought gas will be supplied in the regular way on or before the 25th inst.

MR. H. Weber has been appointed Superintendent of the plants of the Chico (Cal.) Gas and Electric Company.

THE San Leandro (Cal.) Gas Company reports an excellent business in the way of increasing output of gas for fuel use. In fact the same comment literally applies to all the smaller companies on the Pacific Coast.

GENERAL WOOD has issued a decree fixing the price of gas in Havana, Cuba, at $2.50 Spanish gold, per 1,000 cubic feet. The former or ruling rate, if we mistake not, was $3.75 per 1,000 cubic feet.

THE following letter, forwarded to us from Detroit, Mich., under date of the 7th inst., and signed by Messrs. Gordon W. Lloyd, Ernest F. Lloyd and Alfred G. Lloyd, explains itself:

"We have much pleasure in confirming the announcement appearing in the JOURNAL of December 23d, 1901, to the effect that we had sold our interest in and severed our connection with the Western Gas Construction Company, and also in learning that our departure would not in any way alter the conduct and policy of that Company, as controlled and dictated for the last 10 years by Mr. O. N. Guldlin, the President.

"We take this opportunity of announcing to the gas fraternity that our withdrawal from the Fort Wayne Company was our own action, and from reasons other than a desire to abandon the field of gas works construction. We have, therefore, now organized the Lloyd Construction Company, of Detroit, Mich., provided with ample capital and facilities, and are prepared to undertake and carry out any work which may be intrusted to us."

THE Railways and Light Company, of America, the headquarters of which concern are in Baltimore, Md., through the supervision of its Consulting Engineer (Mr. H. L. Rice, Superintendent of the City Gas Company, of Norfolk, Va.), is building a gasholder and installing a distributing system for the National Gas Company, of Berkley, Va. That place is on the Elizabeth river, directly opposite Norfolk. The scheme is to pipe the gas through a high pressure main across the river from the works of the Norfolk Company, and it is thought that the Berkleyites will have gas before spring merges into summer. The holder is being or will be constructed by Messrs. Bartlett, Hayward & Co. Mr. J. W. Wilson, formerly of Charlotte, N. C., has been appointed Superintendent of the Berkley Company.

HOW is this for a local ordinance for mulcting lighting companies, as recently adopted by the Los Angeles (Cal.) Council? Companies (gas or electric), whose receipts are less than $500 per month, shall pay a tax of $25 per month; whose receipts are over $500 and not over $1,000 per month, $50 per month; and whose receipts exceed $1,000 per month, $100 per month. If that schedule can be maintained as constitutional, even under the craziest tenets of the California "constitution," the latter must be the greatest legal instrument on record.

THE business offices of the San Rafael (Cal.) Gas and Electric Company have been removed to spacious rooms in the well located building, No. 732 Fourth street.

AT the annual meeting of the New Haven (Conn.) Gas Light Company the report of President Nettleton showed that the Company had enjoyed a prosperous year. The President outlined the betterments that were being carried on—in this connection it might be remarked that the new water gas apparatus that is to be installed by the U. G. I. Company on the New Haven works is really a renewal, on a much larger and up-to-date scale, of the water gas plant heretofore used—and those that were

proposed to be made. The regular dividend was declared and the following officers were elected: Directors, Chas. R. Ingersoll, Pierce N. Welch, Geo. J. Brush, Francis Wayland, Geo. D. Watrous, Robt. A. Brown, T. Atwater Barnes, A. Heaton Robertson and Chas. H. Nettleton; President, Chas. H. Nettleton; Vice-President, Pierce N. Welch; Secretary, Gardner Morse; Asst. Secretary and Treasurer, F. M. Travis; Supt., F. C. Sherman.

THE proprietors of the Peoples Gas Light Company, of Rutland, Vt., have voted to issue $100,000 of debenture bonds, the proceeds to go to the paying of indebtedness incurred in works' reconstruction, main extensions and the like.

GAS is now being satisfactorily sent out to the residents of Wyandotte, Mich., from the recently completed works of the Wyandotte Light and Gas Company, which are of the coal gas type. The officers of the Company are: President, M. F. Bramley; Vice-President, John Ginzell; Treasurer, John P. Cowing; Secretary, J. R. Ammon; Superintendent, Thos. Holliday; Asst. Supt., Edward Megges.

THE properties of the Litchfield Gas Company and those of the Litchfield Electric Light and Power Company have been consolidated under the title of the Litchfield (Ills.) Gas and Electric Company. Its President is Mr. Robert M. Foster, of St. Louis.

THE following is the text of the decision of the Massachusetts Board of Gas and Electric Light Commissioners, in respect of the appeal of Mayor French, of Gloucester, Mass., to oblige the Gloucester Gas Light Company to put its selling rate at $1 per 1,000:

The Gloucester Gas Light C mpany was organized in 1853, and since that time has been engaged in the supply of gas to the city and residents of Gloucester. It has an annual output of about 33,000,000 feet, used by private consumers, at a net price of $1.20 per 1,000, and 1,000,000 feet used by the city for street lighting at $1. These prices were fixed in 1898, and are the lowest made by any company of equal size in the State. At the close of the last fiscal year the outstanding capital stock was $80,000 and the indebtedness $25,000. During that year the total receipts from gas and residuals was $46,600 and the operating expenses $35,200, leaving a gross profit of practically $11,400. Out of this the Company paid, in addition to the interest upon its notes, a dividend upon its stock of 9 per cent., or $7,200. It has also been able to lease the wharf at its works and has paid from this rental an additional annual dividend of approximately 3 per cent. Since the last reduction in price advances in both labor and materials have substantially increased the cost of manufacture, while the volume of the business and a due regard for the public convenience require substantial additions to the property of the Company.

The Directors have wisely decided that the ultimate interests of the stockholders and the public will be alike conserved by such an immediate increase of capital expenditure as shall have liberal regard for future needs, recognizing the greater economy of such a course as compared with any attempt to provide for the immediate future.

If these plans are carried out, and these or others very similar must be, it will become very questionable whether the present rate of dividend ought to be maintained in the immediate future.

The wharf, from which a substantial rental has been received, will apparently be needed for the general business of the Company, and notice to this effect has been given the tenants. The cost of the new improvements which have been planned and already entered upon will not only employ the proceeds of the new stock whose issue has been approved by this Board, but will substantially increase the present indebtedness.

The Company is thus obliged to face the loss of the income from its wharf and a substantial increase in the volume of its capital with no prospect of an immediate increase in the volume of its business above the normal. For these reasons the present appears to be a peculiarly inopportune time for requiring a reduction in the price of gas.

Based upon the present sales, a reduction of 20 cents to the price of $1, while making no reduction in the operation cost, would decrease the gross profits by about $6,400, making them $5,000, and reduce the funds available for dividends to less than one-half the present amount. The Board, therefore, does not see its way clear to reduce the present price. The petition is dismissed.

The Market for Gas Securities.

Business in city gas shares was dull during the week, Consolidated showing evidence of weakness. The closing to-day (Friday) was made at 216½ to 217—equal to a decline from last Friday of two points. The usual reduction bills have appeared in the Legislature, two notable ones having been put before the Assembly. Assemblyman McCullough in his "pet" measure declares that the rate for a 24-candle power gas in New York city shall not exceed 65 cents per 1,000; and Assemblyman Sanders thinks the fair rate should not be in excess of 75 cents. Both of these worthies belong to the Democratic side of the Chamber, and neither bill has a chance of becoming a law. City gas bonds are held at firmer prices.

The trading in Brooklyn Union was nil, and holders will not consider anything under 219 for it. Lacledes are firm, and the same may be said of Peoples, of Chicago. Baltimore Consolidated is as before. The sensational rise in Washington (D. C.) gas, which is bid for at 350, is accompanied by positive assertions that important changes in respect of its management and policy will take place this spring.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

JANUARY 13.

☞ All communications will receive particular attention. ☜ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	216½	217
Central Union, Bonds, 5's.	3,000,000	1,000	109½	111
Equitable Bonds, 6's	1,000,000	1,000	105	
" 1st Con. 5's	2,300,000	1,000	115	118
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	310	315
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	..	..	
New Amsterdam Gas Co.. Bonds, 5's	11,000,000	1,000	109½	109¾
Northern Union, Bonds, 5's.	1,250,000	1,000	106	108
New York and East River Bonds 1st 5's	3,500,000	1,000	111	115
" 1st Con. 5's	1,500,000	..	109	111
Richmond Co., S. I.	348,650	50	100	..
" Bonds	100,000	1,000	103	..
Standard	5,000,000	100	130	135
Preferred	5,000,000	100	150	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	118	..
Yonkers	299,650	500	120	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	218	219
" " Bonds (5's)	18 000,000	1,000	119	119½
Bay State	50,000,000	50	⅝	¾
" Income Bonds	2,000,000	1,000	.	75
Binghamton Gas Works	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	93	96
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	8½	10
" " Bonds, 5's	5,250,000	1,000	79	80½
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Central San Francisco	2,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas & Elec. Co.	29,500,000	100	102	102½
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	106	107
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	60	65
Preferred	3,026,500	100	84	86
Consumers. Jersey City Bonds	600,000	1,000	102	103
Consumers, Toronto	1,700,000	50	218	225
Consolidated. Baltimore	11,000,000	100	63¾	64
Mortgage, 6's	3,500,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	12	14
" Con. Mtg. 5's	880,000	1,000	79	83
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	.	89
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	381,000	1,000	89	89½
" Inc. 5's	16,000	100	94	94½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	34	38
Fort Wayne	2,000,000	..	..	.
" Bonds	2,000,000	..	53	55
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	102	104
Hartford	750,000	25	245	265
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	60	64
" Bonds, 6's	2 650,000	..	99½	101½
Jackson Gas Co	250,000	50	68	71
" 1st Mtg. 5's	200,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	90	95
Preferred	2,500,000	100	104	108
Bonds	10,000,000	1,000	..	108½
Lafayette Gas Co., Ind.	1,000,000	100		60
Bonds	1,000,000	1,000	48	55
Louisville	2,570,000	50	110	120
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	107½	109½
" 6 per cent. scrip, due 1910	100,000	25	25	87
Montreal, Canada	2,000,000	100	182	184¾
Newark, N. J., Con. Gas Co	6,000,000	..	..	55
Bonds, 6's	4,600,000		..	103
New Haven	1,000,000	25	300	325
Nashville Gas Lt. Co.	1,000,000	100	110	.
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000		..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	102¼	102½
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	
Rochester Gas & Elec. Co..	2,150,000	50	88	
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000		87½	90
San Francisco, Cal.	10,000,000	100	44	44¾
St. Paul Gas Light Co.	1,500,000	100	60	63
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	113½	115
General Mortgage, 5's	2,465,000	1,000	93	96
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	93	96
Syracuse, N. Y.	1,750,000	100	14	16
Bonds	1,612,000	1,000	92	94
Washington, D. C	2,600,000	20	350	351½
First mortgage 6's	600,000	..	..	..
Western, Milwaukee. Bonds, 5's	4,000,000	..	106½	108
Wilmington, Del	600,000	50	252	..

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DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., Dec. 11, 1901.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable Jan. 15th, 1902, to stockholders of record at the close of business, Dec. 31. Checks will be mailed.

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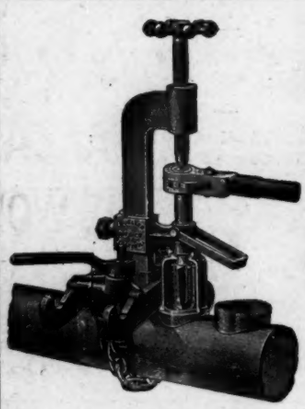

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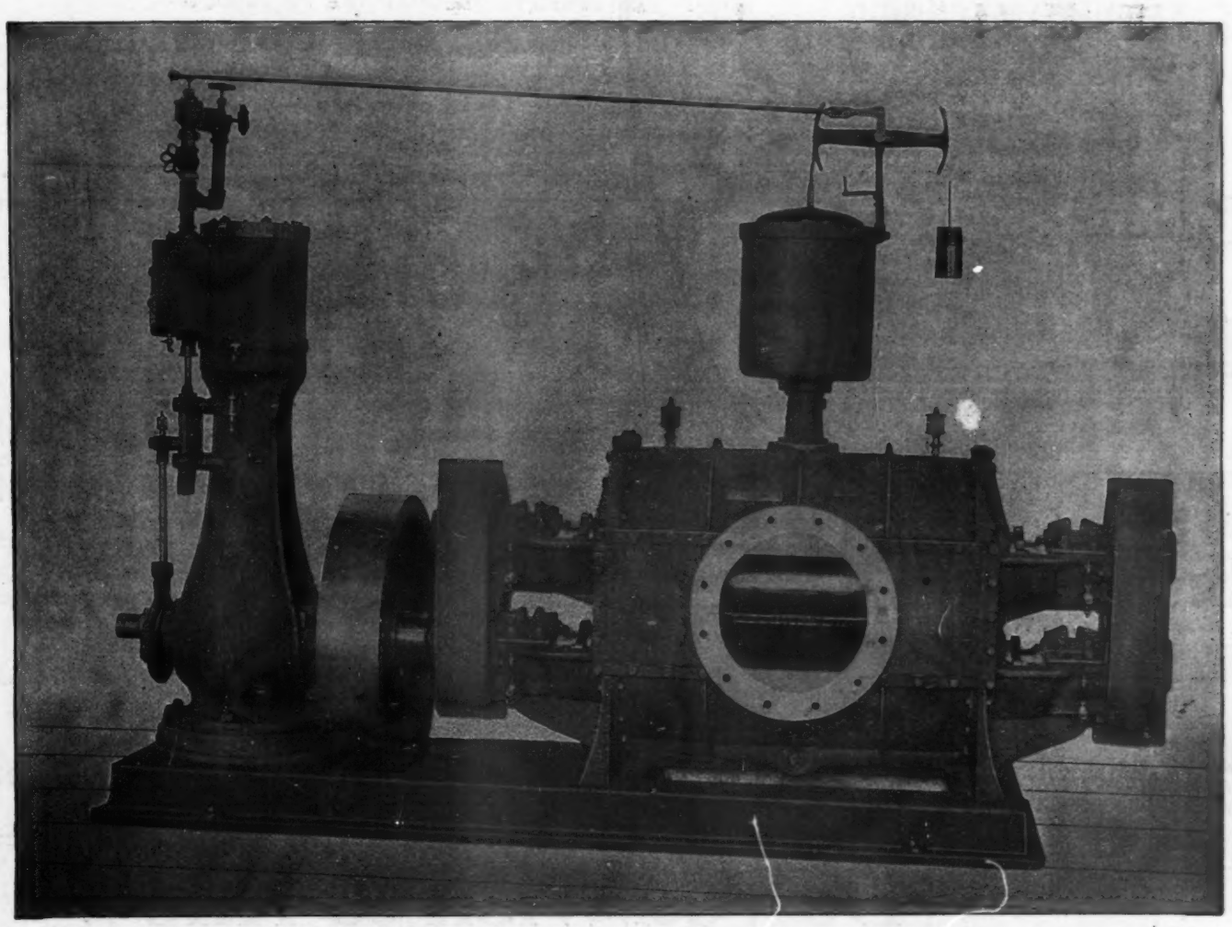

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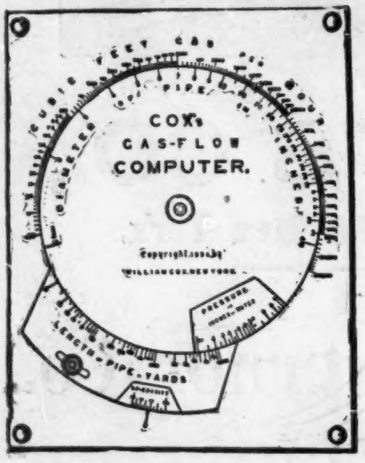

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what size of Pipe to use to convey any quantity of Gas, any distance, with any loss of pressure, and any initial or final pressure? Then use
COX'S GAS FLOW COMPUTER,
as it gives this information accurately at sight, without mental effort. No calculations needed. Saves time, money and mistakes.
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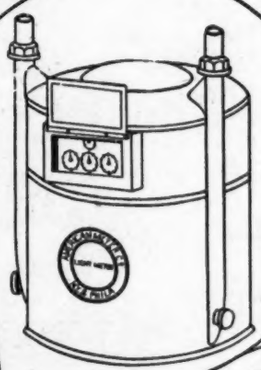
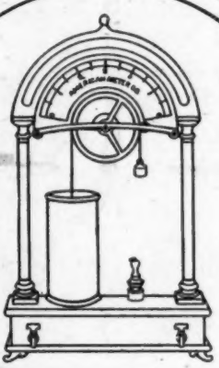
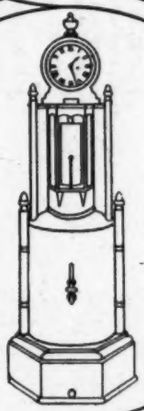
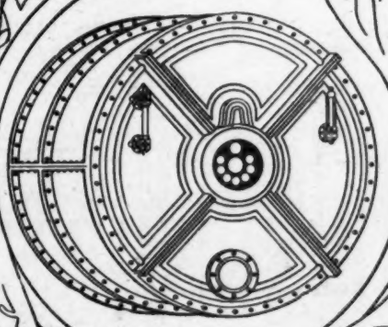








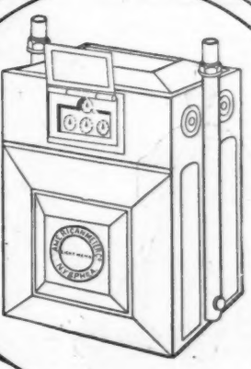
PUBLIC LIGHTING TABLE.

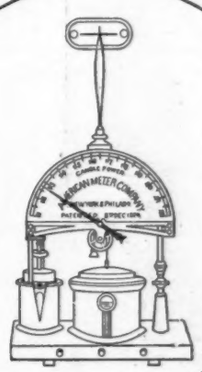
FEBRUARY, 1902.

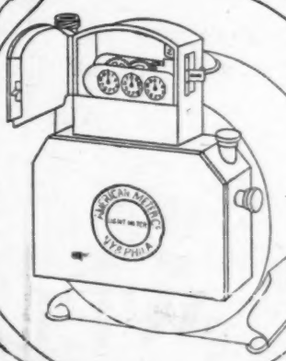
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Sat.	1	5.40 PM	3.20 AM	5.05	6.15
Sun.	2	5.50	4.10	5.05	6.15
Mon.	3	5.50	5.00	5.05	6.15
Tue.	4	5.50	5.40	5.05	6.15
Wed.	5	5.50	6.10	5.10	6.10
Thu.	6	5.50	6.10	5.10	6.10
Fri.	7	5.50	6.10	5.10	6.10
Sat.	8	5.50NM	6.10	5.10	6.10
Sun.	9	6 00	6.00	5.10	6.10
Mon.	10	6.00	6.00	5.10	6.10
Tue.	11	6.00	6.00	5.10	6.10
Wed.	12	6.00	6.00	5.20	5.55
Thu.	13	10.30	6.00	5.20	5.55
Fri.	14	11.40	6.00	5.20	5.55
Sat.	15	12.40 AM	6.00	5.20	5.55
Sun.	16	1.40	5.50	5.20	5.55
Mon.	17	2.40	5.50	5.20	5.55
Tue.	18	3.30	5.50	5.20	5 55
Wed.	19	4.10	5.50	5.30	5.55
Thu.	20	4.50	5.50	5.30	5.55
Fri.	21	No L.	No L.	5.30	5.55
Sat.	22	No L. FM	No L.	5.30	5.55
Sun.	23	No L.	No L.	5.30	5.55
Mon.	24	6.20 PM	9.20 PM	5.30	5.55
Tue.	25	6.20	10.20	5.30	5.55
Wed.	26	6.20	11.10	5.30	5.45
Thu.	27	6.20	12.10 AM	5.30	5.45
Fri.	28	6.20	1.10	5.30	5.45

TOTAL HOURS LIGHTING DURING 1902.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	238.30	January	423.20
February	196.20	February	355.25
March	196.20	March	355.35
April	166.40	April	298.50
May	151.40	May	264.50
June	131.10	June	234.25
July	142.40	July	243.45
August	162.00	August	280.25
September	179.00	September	321.15
October	216.30	October	374.30
November	224.10	November	401.40
December	250.00	December	433.45
Total, yr.	2255.00	Total, yr.	3987.45



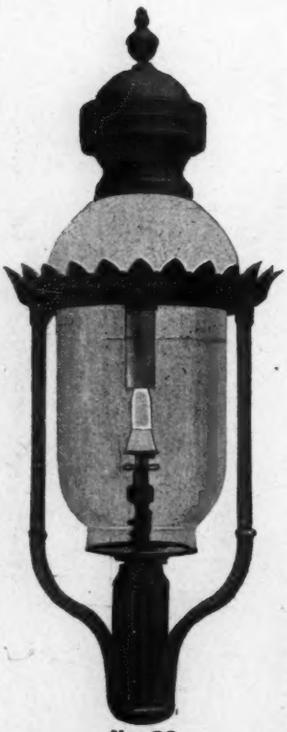




NEW YORK, 33 Nassau Street. PHILADELPHIA, Broad and Arch Streets. CHICAGO, Foot of Orleans Street. BOSTON, 624 Tremont Building.
CLEVELAND, 809 Cuyahoga Building. ST. LOUIS, 712 Roe Building. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



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Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

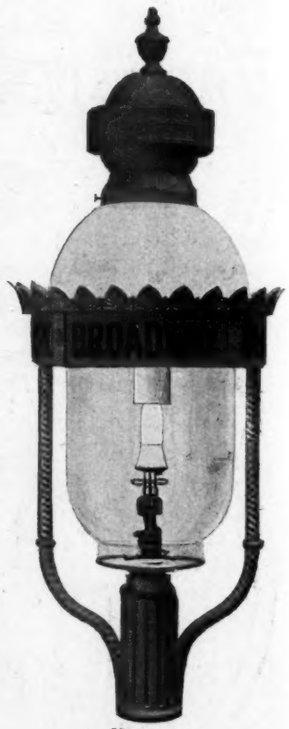
POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

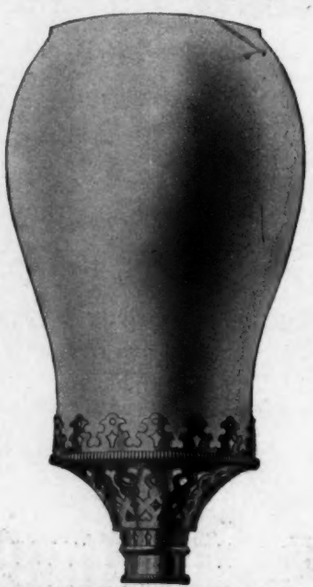
Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others Interested in Municipal and Outside Lighting.



No. 38.

UNIVERSAL WELSBACH BURNER.



The most practical, efficient and artistic burner yet produced. . . . . .

It contains an improved adjustable Bunsen so constructed as to permit of a wide range of variations in gas pressure without blackening the mantles and without an adjustable air shutter. . .

It can be used with all styles and sizes of glassware, either shades or globes. No further necessity to carry a stock of different burners for the many sizes and shapes of glassware.

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In Kegs, 100 to 200 " " 6 " "
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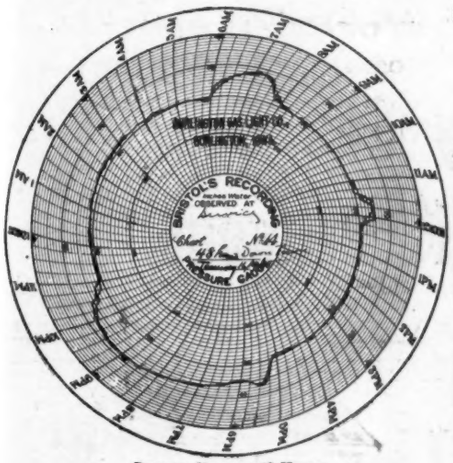

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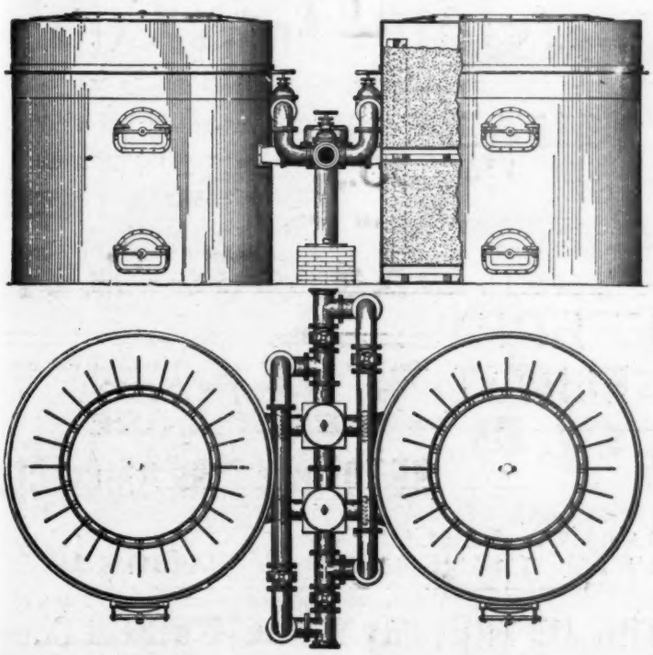

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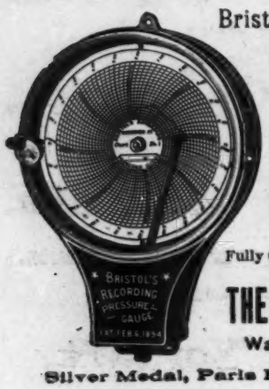

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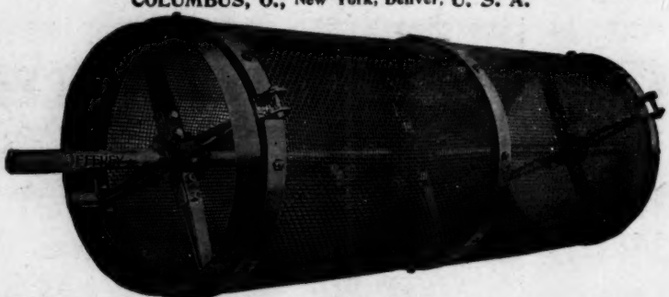

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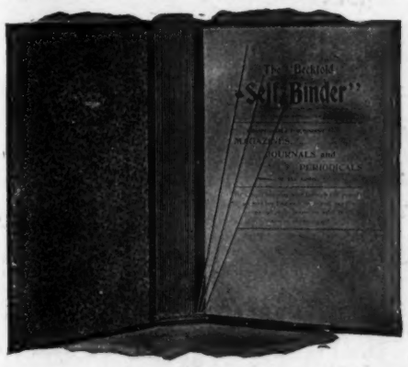

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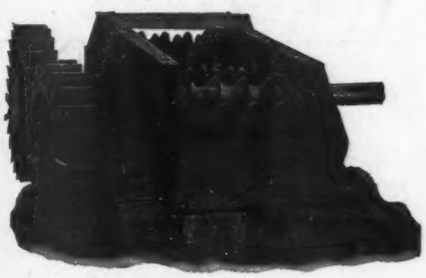

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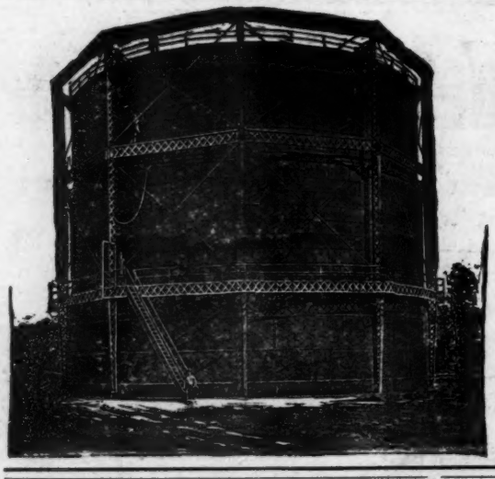

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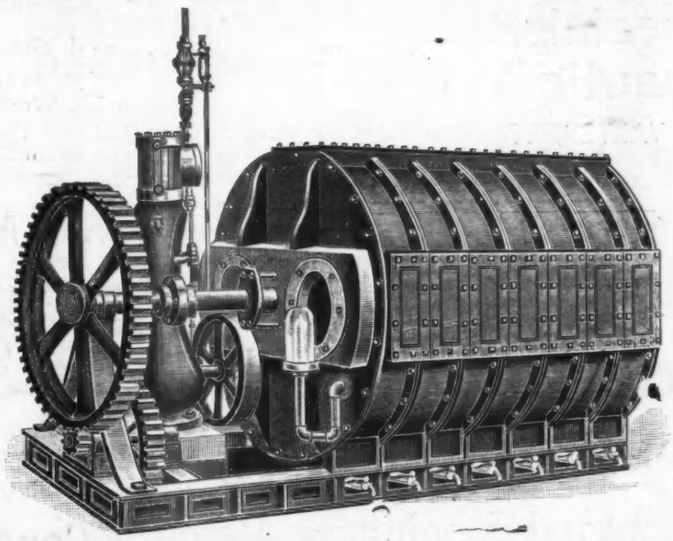

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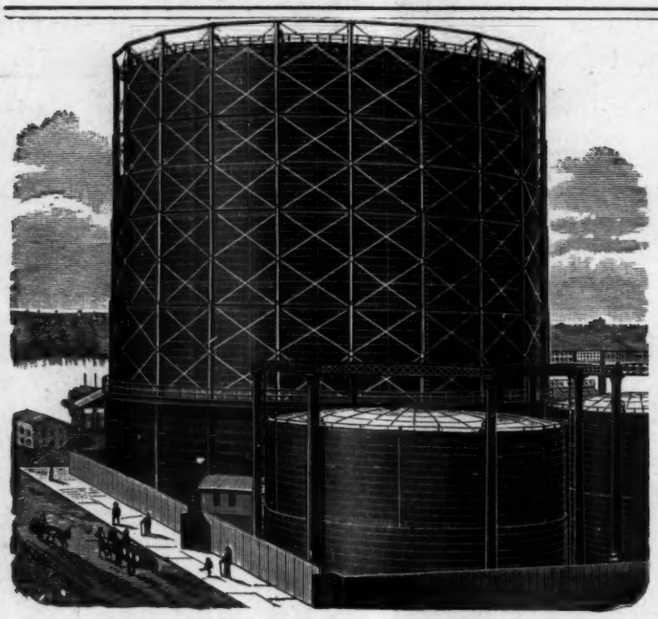

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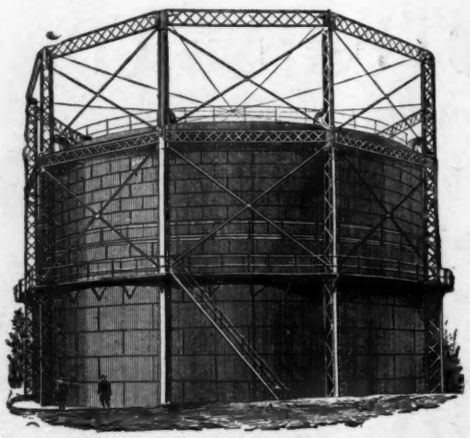

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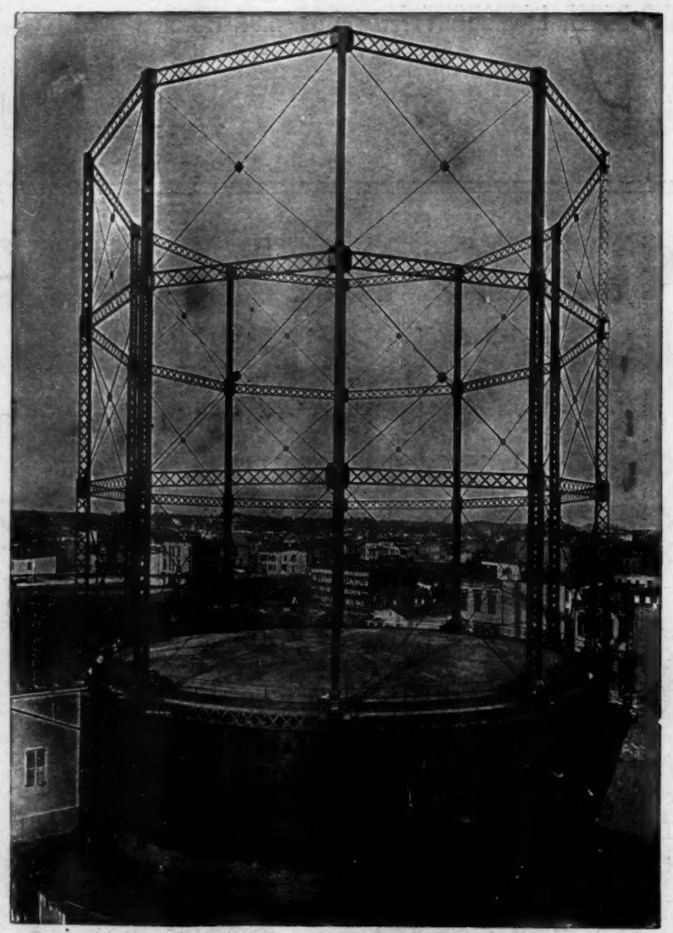

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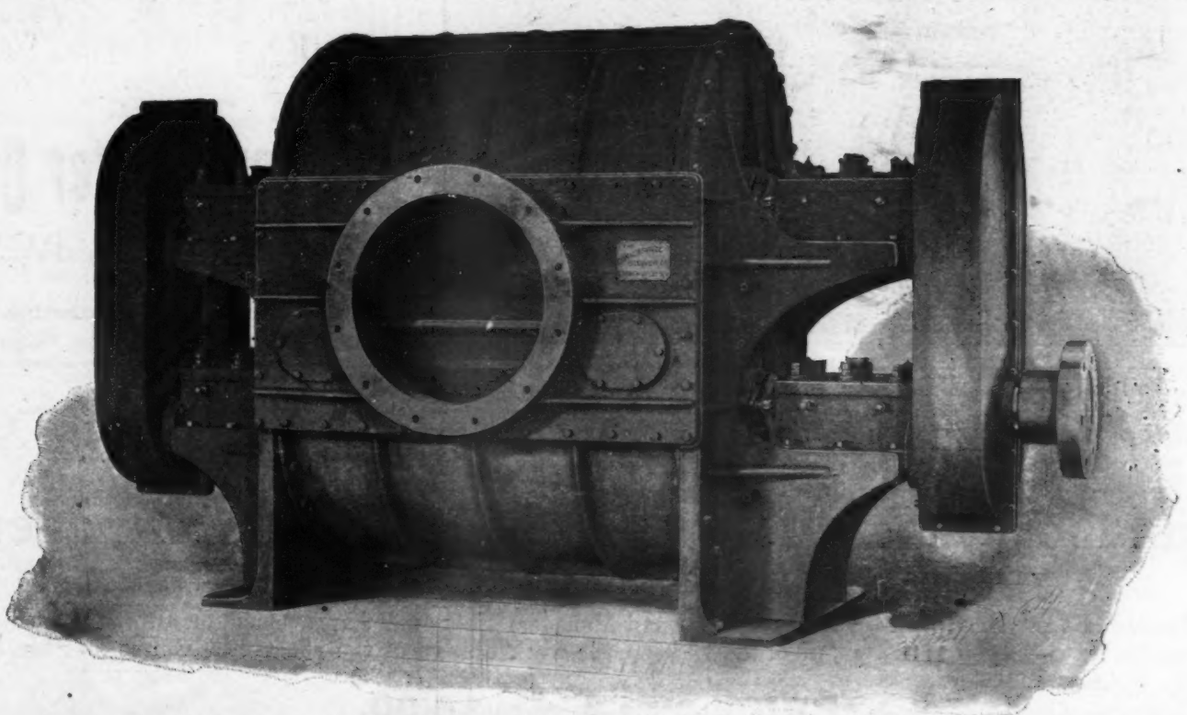

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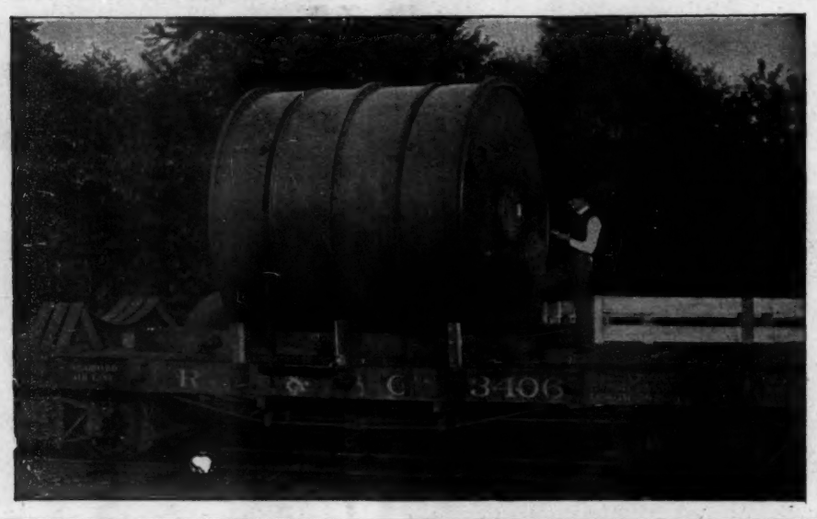

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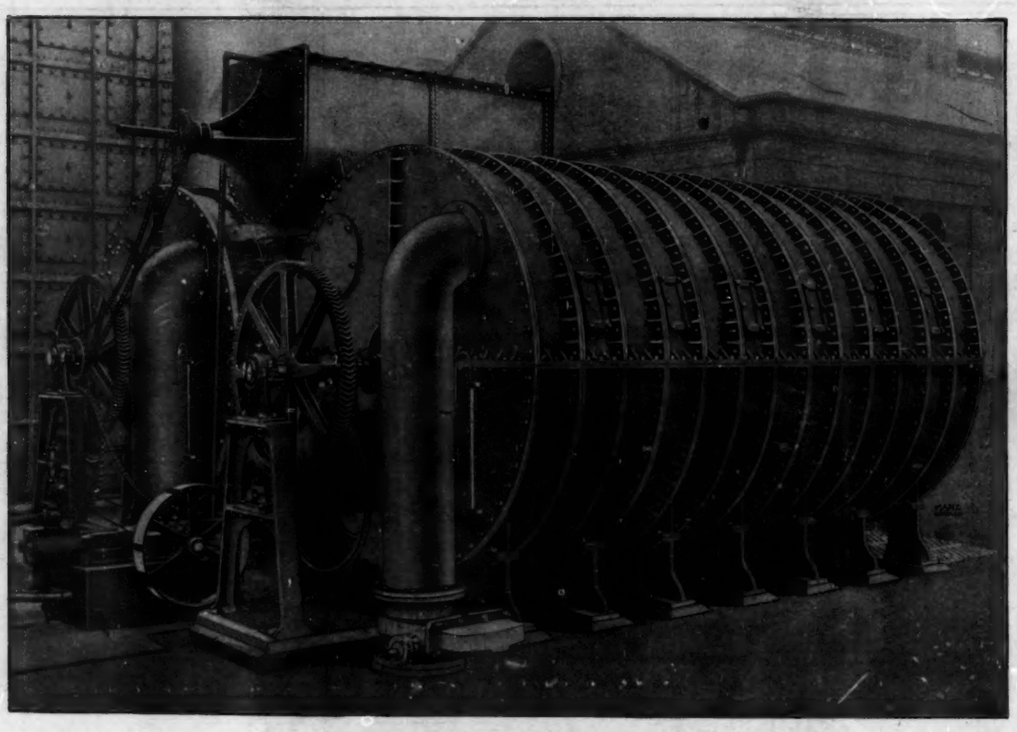

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